July 1965

culture

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Growing tomatoes without guesswork . . . *J. A. H. Nicholson*
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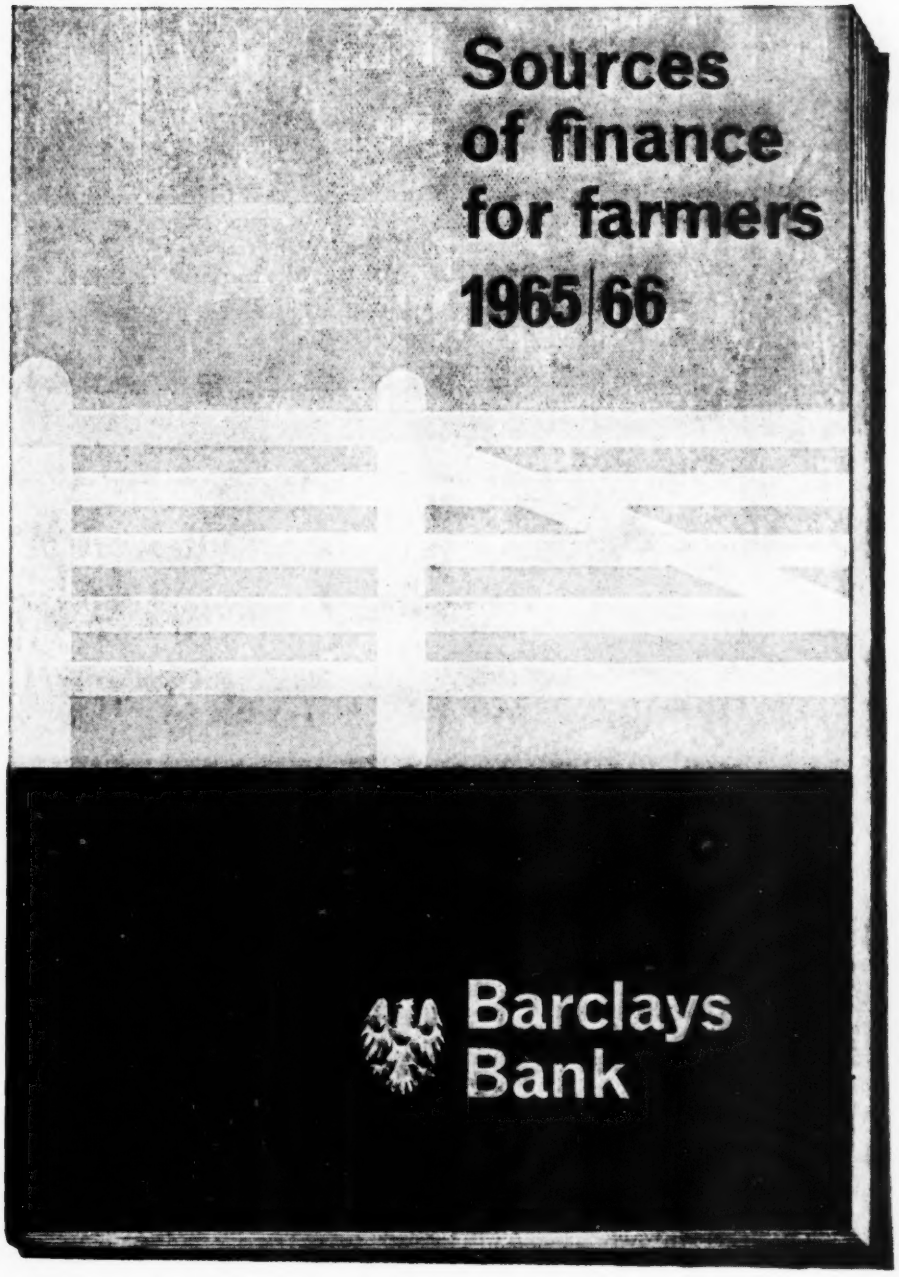

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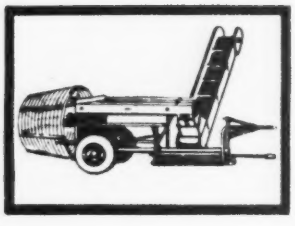

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Agriculture

VOLUME 72 · NUMBER 7 · JULY 1965

Editorial Offices
Ministry of Agriculture, Fisheries and Food
Whitehall Place, London S.W.1. Trafalgar 7711

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Beef on the Side

BEEF is in short supply and therefore prices remain firm. Prices for cereals, on the other hand, are likely to be lower. In these circumstances it is understandable that arable farmers may be tempted to transfer a part of their arable acreage from cereals to grass with the idea of producing grass-fed beef. Is this wise?

Although the changes in the rates of guarantee for beef and cereals, announced in the recent Price Review, have narrowed the profit differential between the two activities, the traditional role of beef as an ancillary enterprise on arable farms remains.

In this respect, grass-fed beef can be profitable under three conditions. First, that grass is regarded as a by-product of arable farming and the grass acreage is limited to the requirements imposed by the rotational or physical features of the farms. Second, that the size of the beef enterprise does not exceed that imposed by this unavoidable grass acreage. Third, that the system of production adopted does not compete with any other major enterprise for the use of other factors of production. Although the profit from the beef enterprise may be increased if one or more of these conditions is broken, total farm income will be reduced if resources are directed from a high to a lower earning enterprise.

Grass is still a costly feed on arable farms if it is produced at the expense of cereals. Therefore arable farmers should continue to resist the temptation to substitute grass-fed beef for cereals, unless other factors—notably disease control—dictate an unavoidable increase in their grass acreage.

Gwyn James

THE BEEF RECORDING ASSOCIATION,

which came into being in 1963, has as its long-term aim the provision of an effective recording service for the whole of Great Britain

Beef on Record

Ken Baker
Chief Executive Officer, B.R.A.

THE late 1950s and early 1960s saw the first tentative moves taken in this country to establish organized beef recording. Following the beef weighing undertaken on farms by Cambridge University, commercial beef recording societies were formed in the eastern and southern counties of England. Beef recording groups were also started by the N.A.A.S. and the College Advisory Services in Scotland. Several of the pedigree beef breed societies organized recording schemes on breeders' farms, and groups of beef bulls were performance-tested at centres established by official and commercial organizations.

These were preliminary steps, but they coincided with the introduction of a new major technique, 'barley-beef', and with the controversy centred around the proposed use of Charolais bulls. Both innovations highlighted the lack of factual information on beef production and breeding, and it added urgency to the need for data to be collected. In order to link up the work of the various organizations and to create unified recording systems, it was

obvious that we ought to have organization concerning the whole country; and this was one of the principal reasons why the Beef Recording Association (U.K.) Ltd. was established.

The Association intends to create recording services which will be of value to both pedigree and commercial beef producers and which will co-ordinate the collection and interpretation of records from breeding cattle, commercial beef production and carcass evaluation. The Association will provide information to individual farmers which will give guidance on future feeding, management or breeding policies within their own beef enterprises. At the same time the accumulation of the data on a national scale will be used to compare the relative physical and financial efficiency of different beef systems and to determine the performance of various breeds and crosses within the different systems. In addition, production standards will be established so as to give farmers yardsticks against which to compare their own levels of production.

Organization of beef recording

Beef recording is being organized through local societies which are based regionally. Members of local societies are able to use a mobile weighing unit at a charge of 2*s*. per animal weighed. Beef producers will be encouraged to keep detailed feed records, a full feed recording service will be operated and the rapid processing and interpretation of the data will form a major part of the service. Similar facilities for record processing and interpretation will be available for members with their own weighing machines. It is stressed that a major benefit to members will be the development of standards by which they will be able to judge the physical and financial efficiency of their own beef enterprises; the information will also be of great value when used in conjunction with N.A.A.S. or other farm management advisory schemes, as it will provide the data from which advisory and farm management decisions can be taken.

During the past six months the Eastern and Southern Counties Beef Recording Societies have amalgamated with the B.R.A.—these two societies are primarily concerned with commercial recording. Societies have also been formed in North-East Scotland, Lincolnshire and South Devon in order to co-operate, and to develop recording, with the Aberdeen-Angus, Lincoln Red and South Devon breeds respectively. The areas covered by these three societies all possess large numbers of commercial beef producers, and the B.R.A. staff in these societies will combine pedigree work with commercial beef recording. Two more societies have recently been formed in Warwickshire and Yorkshire, bringing the total number of recording societies to seven. Although several of these are still in the early stages of development, it is anticipated that the mobile units will make about 40,000 cattle weighings this year.

Commercial beef recording

Within any system of beef production it is becoming increasingly apparent that the greater the liveweight gain, the greater is the feed efficiency and the lower the cost of feed per pound of liveweight gain. As feed accounts for two-thirds or more of the total cost of producing a carcass, this is a most important factor, and the first step in recording on commercial beef farms is to obtain information on the liveweight gains of cattle and the feed costs.

Data taken from farms within the existing recording schemes have highlighted these factors, and feed costs per pound of liveweight gain have ranged from 7*d.* to over 4*s.* (Returns to the farmer will be between 1*s.* 7*d.* and 1*s.* 10*d.* per lb live weight.) Similarly, Table 1 shows the range of gain and feed cost per pound of gain which has been found within a single type of beef production.

Table 1

Rate of gain and Cost per lb of gain

	Farm 1	*Farm 2*	*Farm 3*
lb l.w.g. per day	1·9	1·5	0·75
Feed cost per lb l.w.g.	1*s.* 5½*d.*	1*s.* 11*d.*	2*s.* 6*d.*

Many of the recording farms have been producing barley beef, and those weighing every month and keeping feed records have shown the value of records both for checking on the rate of growth and for sending animals for slaughter at the right weight. Thus Table 2 shows the marked drop in performance obtained on one unit once the animals had reached 800 lb live weight in the sixth month on barley beef.

Table 2

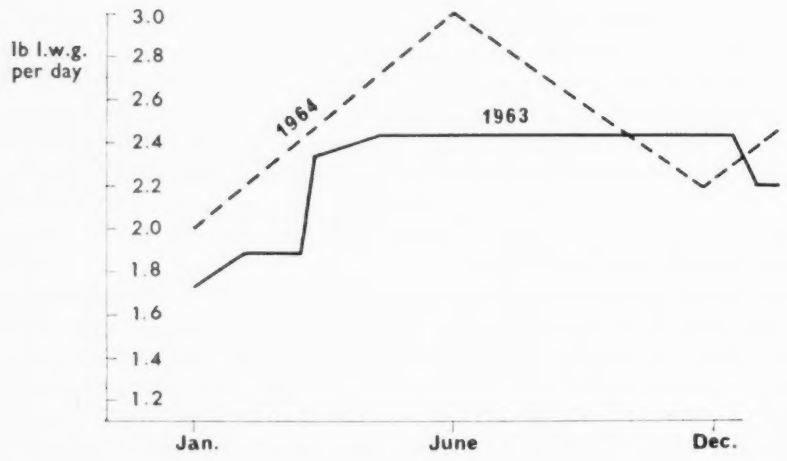
Intensive Barley Beef

Friesian Steers
(300 lb live weight at Month 1)

Month	1	2	3	4	5	6
Liveweight gain (lb/day)	2·9	3·3	3·4	3·3	2·9	2·7
Food conversion	4·0	4·2	4·8	6·0	6·6	6·9
Feed cost per lb l.w.g.	1*s.* 0*d.*	1*s.* 1*d.*	1*s.* 2*d.*	1*s.* 6*d.*	1*s.* 8*d.*	1*s.* 9*d.*

In 1963 and 1964 the monthly average daily gains of several hundred cattle on barley beef in southern England also showed marked seasonal fluctuations:

Average daily gain of cattle fed intensively on barley
(Southern Counties Beef Recording Society)



The available data is not sufficient to indicate accurately the reasons for these seasonal changes, but the results were general over the farms involved and were not apparently due to changes in the average live weight of the cattle involved. (In 1964 the average monthly weight ranged from 570 to 690.) To help interpret such data and to encourage the collection of more relevant details such as type of housing, disease problems, etc., it is planned to form discussion groups within each recording society and each discussion group will be concerned with a particular aspect of production, e.g., barley beef, grass beef, suckler herds, etc.

Breeding records

The breeders of beef cattle are fortunate in that the heritability of liveweight gain is high and a positive selection programme can be followed. There is no antagonism between liveweight gain and conformation, so that selection for high rates of gain can be made within groups of animals with good conformation. The purpose of recording in breeding herds is to identify the young cattle which have the greatest potential for growth and, at the same time, to build up progeny records of the breeding stock. There are difficulties within any one herd, as the number of cattle involved is small and the different sexes of the calves and ages of the dams can have a marked influence on the weaning weight of calves.

Several years ago the Lincoln Red Society appreciated the value of accumulating authenticated and continuous records within their herds—and they are now co-operating with the B.R.A., both in the assessment of the data collected so far and in future recording. The average 250-day weights for bull, steer and heifer calves from four-year-old Lincoln Red cows are 710, 590 and 550 lb respectively. There are, however, marked changes in these weights depending on the age of dam. Thus bull calves from two-year-old dams average 630 lb at 250 days; this figure rises to 710 lb for bull calves from four-year-old dams. There are further, but smaller, increases in 250-day weights as the dams get older, and the breed average for ten-year-old dams is 780 lb. Similar, but smaller, changes occur with steer and heifer calves and the pattern is repeated with the 400-day weights.

The full implications and reasons for these changes are not yet understood, but as more data and experience are accumulated the results will prove increasingly valuable in comparing calf weights and in assessing the progeny records of individual bulls. A study of the existing information shows a marked variation in the average 250- and 400-day weights of calves from different herds. This will often be due to the variable conditions under which the animals have been kept, and is a major reason for establishing central performance-testing centres where animals within a single breed can be brought together for testing under uniform conditions.

The Hereford Herd Book Society and the Yorkshire Agricultural Society have co-operated wholeheartedly with the B.R.A. in running a Performance Test with Hereford bulls at Harrogate. Thirty-six bulls were collected together at 7–9 months of age and, after a settling-in period of six weeks, have been receiving uniform management and feeding regimes. After twenty weeks on test the bulls will be compared for weight for age, conformation and feed efficiency. It is intended that this work will ultimately be linked with performance testing within pedigree herds, progeny testing within commercial breeding herds and carcass evaluation.

Long-term aim

The beef industry is the second major agricultural enterprise in this country, and for it to be really profitable it is essential to accumulate far more data on the input/output relationships in the different types of beef enterprises. Therefore the long-term aim of the B.R.A. is to provide an effective recording service for the whole of Great Britain. This will include on-farm recording for both pedigree and commercial herds, bull performance testing, progeny testing and carcass evaluation.

Inevitably, many advisory and farm management problems will arise, and for this reason very close contact and liaison will be maintained within each region with the local N.A.A.S. or College advisers. It is planned that the individual farm results of recording will be available immediately to the farmers concerned as a management aid; in addition the central processing of these data will provide national physical and economic information which will be of direct value to the beef industry.

Kenneth Baker, B.Sc., Ph.D., Dip.Agric., Chief Executive Officer of the Beef Recording Association (U.K.) Ltd., is President-elect of the British Grassland Society. Before joining the Association, he spent eleven years at the Grassland Research Institute, for most of which time he was Head of the Extra-Mural Department concerned with extension trials on commercial farms throughout England and Wales.

Oxford Farming Conference Report

The papers presented to the 1965 Oxford Farming Conference in January of this year, and the discussions which followed, are printed in full in the Report and Proceedings of the Conference, copies of which are now available.

They may be obtained from M. R. H. Soper, Department of Agriculture, Oxford University, Parks Road, Oxford. 10*s*. (including postage).

"In the past we have been too greatly concerned with the cow's efficient utilization of the land instead of increasing her biological efficiency"

says **Dr. T. R. Preston**

in this speculative and thought-provoking article

Feed into Milk

THE dairy industry today is in the same state as the beef industry was four years ago—relatively inefficient. There is no other way that we can explain the low average yield per cow in the United Kingdom, which is just short of 800 gallons. One reason for this has been the application of a set of criteria which I consider inappropriate for the measurement of efficiency. I should like to speculate a little, although there is some substance behind my remarks. In the past we have been greatly concerned with efficiency of utilization of land by the cow instead of concentrating on increasing her biological efficiency. The real yardstick of efficiency should be the amount of feed (productive energy) required per lb of milk produced. Once we can assess the productivity of the cow in these terms there is opportunity for improvement—and that can be achieved most rapidly by increasing her rate of production relative to maintenance.

Two conditions must be satisfied. First, there must be maximum genetic potential for milk production, and the standard should be a minimum yield per cow per year of at least 1,000 gallons and a herd average of 1,200 gallons—preferably higher. This potential exists already, for there are many herds which do yield this quantity of milk; the reason that so many others yield less

is almost entirely a function of feeding and management rather than genetic inability. There should also be a reappraisal of hormones such as thyroxine, and growth hormone, which are known to stimulate milk yield. For although these hormones were shown to be unprofitable in some early experiments when animals were carefully rationed, it does not follow that this will always be the case with more liberal feeding.

Energy intake

Assuming sufficient genetic merit, the next problem is to achieve the necessary energy intake to allow this potential to be expressed. Digestibility is the most important factor, and in general the lower the fibre content of the diet, the greater is the voluntary intake of productive energy. This relationship holds for diets containing less than 70 per cent cereals but it does not apply with more concentrated diets. In this context other factors such as the degree of processing of the cereal and the frequency of feeding begin to take effect. Generally, however, it is not possible to increase energy intake further, except by the use of very high energy ingredients such as fat or oils.

Another important factor is that however concentrated the diet, it is impossible for a high-producing cow at the peak of her lactation to consume enough of it to satisfy her needs for maintenance and production; and inevitably at this point, which may extend over the first three months of lactation, she has to depend on energy reserves in the form of body fat to supplement the energy she receives from the ration. Without adequate body reserves, the milk yield inevitably declines. It is possible that the sole merit in steaming-up is to acquire these energy stores.

Another interesting finding which has emerged from recent experimental work is that these reserves of body fat can be acquired much more efficiently during lactation than when the animal is dry. Thus it may well prove to be most economic in the long run to maximize feed intake during the whole of a lactation, with the dual aim of securing maximum milk flow and at the same time allowing the animal to acquire the necessary body condition for the ensuing lactation; and then during the latter part of lactation when the animal is dry to reduce feed intake to a point which will supply only slightly more than maintenance needs. This is in fact the pattern of events when a cow is fed *ad lib*.

It is not only important to achieve high energy intake, but the end products of digestion of the energy component in the diet (the short-chain fatty acids) must be present in the right proportions to ensure their maximum conversion into the main organic constituents of milk. As the overall proportion of cereals to roughages (i.e., starch to cellulose) increases, there is an accompanying increase in the ratio of propionic acid to acetic acid and butyric acid. An initial increase in this ratio is beneficial, for where there is too much acetic acid, energy tends to be lost as heat. But with an extreme diet containing only concentrates and no roughage, the rate of production of acetic acid declines to the point where the synthesis of milk fat (for which acetic acid is the main precursor) is seriously reduced; this also has an overall effect in reducing milk yield. Contrary to what happens with all roughage rations, however, the energy which does not go into milk is not lost to the animal but is deposited as body fat and is thus available for use in a subsequent lactation. On the other hand, bearing in mind the need to have maximum milk production of adequate compositional quality, it is clearly important that sufficient acetic

acid is produced in relation to the total amount of energy available. This really is the crux of the problem in intensive feeding of dairy cows.

Concentrate/roughage ratio

The ideal ratio of concentrate to roughage, in terms of producing sufficient acetic acid for milk fat synthesis, is approximately 33 per cent roughage and 66 per cent concentrate. This ratio cannot be achieved by *ad lib.* feeding of concentrates and roughages separately (the simplest feeding system), since in this case voluntary consumption of roughage rarely accounts for more than 10 per cent of the total diet. Moreover the poorer the quality of the roughage the lower is the voluntary intake of it as a proportion of the total diet. It is both difficult and expensive to guarantee sufficiently high quality roughage to ensure that the cow will eat enough of it. The other approach is to process roughage and mix it with concentrate in the desired proportions so that the cow has no opportunity for selection. This is effective but also expensive since in this country the major roughage sources are hay and straw. One can also deliberately restrict the concentrate allowance, and this does lead to greater consumption of roughage; but the overall effect of this is to bring about a reduction in the total amount of energy consumed.

The likely choices available are therefore (1) to use processed roughage and mix it with concentrate in a complete diet; (2) to ensure a high-quality roughage by the use of barn-dried hay or dried grass during the winter months, and fresh grass during the summer; and (3) to use a synthetic source of acetic acid. At the present time the second method is the most practicable, but for the future the first and third methods offer the greatest possibilities for maximizing intake of productive energy whilst at the same time ensuring that the fatty acids available for milk synthesis are in the best possible ratios.

Protein factor

Of necessity, provided of course that the cow has sufficient genetic merit, we should aim at maximizing intake of energy. As regards other nutrients, however, we should take the opposite approach and reduce them to the minimum that is compatible with efficient utilization of energy, the production of milk of adequate composition and maintenance of health.

Protein is the next most expensive nutrient, and it is here that high cereal diets have distinct benefits since in the rumen they provide a highly favourable medium for bacterial growth, and this in turn results in a situation which is ideal for the utilization of non-protein nitrogen, as from ammonia or urea. It has been shown experimentally that cows can produce milk on synthetic diets which contain no true protein, and while this is an extreme condition which will never apply in practice (at least half of the dietary nitrogen is provided by cereal protein anyhow), the indications are that almost all the supplementary nitrogen needed in high-energy diets can be provided from non-protein sources. It does not follow that the bacterial flora will synthesize all the essential amino acids fast enough to satisfy requirements for very high milk production, and it may be necessary to devise ways of supplementing bacterial protein with the essential amino acids which are limiting (e.g., lysine and methionine). Nevertheless the cheapness of ammonia and urea at the present time is likely to offset any marginal loss of efficiency from their use as compared with natural proteins. The same minimizing approach should be

taken with minerals and vitamins, although it must be emphasized that the minimum requirements of these (and certainly vitamins A, D and E) are considerably greater than the standards we have applied in the past.

Management care to offset disease risk

An important aspect of profitability is incidence of disease. What is the likely effect of intensive feeding? In theory, acetonaemia should not be a problem where there is *ad lib.* feeding of high-energy diets, and experience bears out that this is in fact the case. We may also expect a reduction in metabolic upsets such as hypomagnesaemia and hypocalcemia. But a distinct hazard is acidosis. This is an upset in the animal's acid-base balance caused primarily through over-eating of cereals. It is the most serious disease problem likely to be encountered. Careful management, using efficient self-feeders or automatic feeders dispensing food at frequent intervals, is the best safeguard, the aim being to prevent cows eating excessively at any one time.

Another condition we have encountered as a sequel to high grain feeding is laminitis, or founder. This is an inflammation of the sensitive inner part of the hoof; the rear feet are most commonly affected. It develops readily when animals are tied permanently in byres with hard floors. Regular exercise seems to be the best preventive and it is therefore highly desirable that animals on high-energy diets should be loose housed.

The incidence of other diseases such as mastitis and infertility should not necessarily be affected by a higher plane of nutrition. The only exception in this respect is likely to be with excessively fat animals, since these are sometimes prone to calving difficulties. But the mere fact that they are excessively fat is a certain indication that they are inefficient for milk production and they should be culled anyway.

Finally, there are some distinct advantages in favour of intensive feeding on an *ad lib.* basis since individual rationing of cows is no longer necessary and there is a problem of feeding large amounts of concentrates in milking parlours. These simplifications can save investment in equipment and labour.

Conclusion

It is not practicable at the present time for dairy cows to be fed *ad lib.* on high-energy diets, but if in the future the system can be developed, it is only likely to be economic for cows capable of yielding a minimum of 1,200 gallons. We have as yet no means of guaranteeing that the required amount of feed (5–6 tons per animal) can be compounded in such a way that adequate milk quality will be achieved without the final cost of the feed rising above £27–30 per ton. Barley, non-protein nitrogen, minerals and vitamins are the obvious main ingredients, and complete diets based on these have been in use at the Rowett Research Institute for some time now.

The major difficulty we still face is maintaining the milk fat percentage above 3 per cent. (Regulations provide that percentages of less than that raise a presumption that the milk is not genuine.) The resolution of this problem rests with supplying the animal with greater quantities of acetic acid than is produced normally on an all-cereal diet. Whether this deficiency can be resolved by processing roughage so that it can be incorporated in the complete ration, from synthetic sources within the chemical industry or by use of chemical additives to control the pathways of rumen fermentation, will depend on the results of research now in progress.

Handling and Storing Potatoes [2]

J. H. Clift

THE damage arising from grading on the farm has been highlighted by the Potato Marketing Board surveys. Consequently, a pre-packer may not want any farm grading to be done. It may therefore be prudent to plan for a situation where rapid store unloading, direct into a central grading station's transportation vehicle, is a requirement. This is not to say that the duct unloading system is the ultimate. The theoretical angle of repose of potatoes is 45 deg. But in early spring a veritable cliff face of potatoes in an indoor store is a not uncommon sight, at the foot of which the man with the potato fork keeps a wary eye open. Quite what would happen if a stack of potatoes avalanched on to an unloading elevator may be left to the imagination. A stoppage through choking of the elevator or overstraining the mechanism is within the realms of conjecture and would cause considerable delay.

Another answer to the handling and unloading problems of storage which certain Yorkshire farmers have adopted is the system of pallet box storage. The use of pallet boxes for handling and storing potatoes began in

The picture above shows potatoes being handled at a washing and pre-packing plant in Yorkshire. The box holds one ton and is robustly constructed so as to withstand repeated handling and inversion by the rotating head fork-truck. A large-capacity box can form the basis of a satisfactory handling system at various stages in the dressing and washing process at such a plant, because high frequency of use can be set against considerable expense of boxes and sophisticated industrial fork-lift truck equipment

America in 1944, following a war-time shortage of large timber such as had been used in the construction of potato stores. Short lumber for boxes was readily available.

Operators of box storage systems may be seed merchants faced with the problem of keeping separate a number of varieties, even a number of different lots of the same variety. Or they may be ware growers who consider that conventional bulk storage does not produce a potato of good enough quality. This factor of quality may be divided into two aspects—mechanical damage and the loss of colour, bloom and freshness. The intentions of using boxes for storage are, firstly to avoid mechanical damage because the boxes can be filled direct from the pickers' baskets or from the harvester output conveyor, and are only handed again when ready for grading; secondly, that potatoes in boxes can be so managed in respect of temperature and humidity as to preserve colour, bloom and freshness.

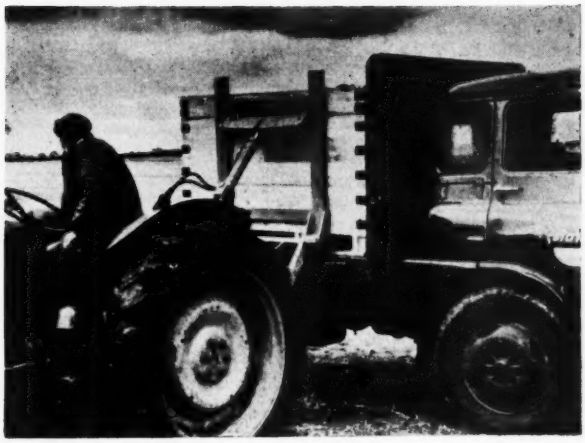
Pallet boxes in the field

Filling boxes in the field can be carried out as carefully or as carelessly as the filling of any other type of container. It is as tempting, and as punishing, to drop potatoes into a pallet box as it is to throw them out of a basket into a cart. The problem of mechanical damage is fundamentally one of the degree and persistence of supervision, as much as the choice of equipment. The adoption of a technique may be modified by mechanical limitations. Take, for example, the operation of filling a pallet box from a picker's basket. Ideally, the picker should lean over the box, lower the basket inside, and then gently invert it so that no potato falls more than 9 inches. This *can* be done if the upper rim of the pallet box does not reach above hip height.

In attempting to make box storage an economic proposition, it is desirable to have the largest capacity box that can be mechanically handled. The cost of the boxes per ton of potatoes is a key factor, and large-capacity boxes can be shown to cost less per ton than smaller boxes. In order that tractor fork-lifts can handle these large boxes in the field, the base of the box may be designed so as to keep the box tucked in as closely as possible to the rear of the tractor. To get high capacity, the box may need to be constructed so that its top rim is considerably above hip height for the pickers, who have less chance of controlling the length of drop.

In filling boxes placed on a trailer from a complete harvester, a high level of precision and conscientiousness is demanded of the operator if he is consistently to lower the output conveyor into each box. Filling a conventional trailer from a harvester equipped with a hydraulically-controlled output conveyor is much more simple, and a stricter adherence to the nine-inch rule may be expected under these circumstances.

The capital cost of box storage has been investigated. The cost of the boxes may vary between £2 and £8 per ton stored depending on the design and materials used. The construction of a box which comes in at the lower end of the price scale requires that it be emptied by the use of a tipping device which cradles the box and takes up the thrust of the contents as they are inverted. Therefore the industrial fork truck or tractor with fork is 'in delay' whilst the box is being inverted on such a device. Towards the top end of the price scale a box can be constructed that is sufficiently strong to stand up to the strains of inversion on a rotating fork head of an industrial type fork truck.



One-ton wooden boxes being loaded on to a pre-packer's lorry by a rear-mounted fork lift fitted to a normal farm tractor. The boxes can be filled directly from picker's baskets, although careful pouring is most desirable to avoid damage by a long drop

A system where the box is inverted by the fork-lift truck enables the unstacking and emptying operation to be truly a one-man job and at the same time should reduce the handling time per ton. The fork truck operator has only to guide his vehicle and his forks once into the box and once out again, whereas with a separate tipping device the fork operator has to perform two in-fork and two out-fork manoeuvres. These manoeuvres require skill and precision if rapid deterioration of the pallet boxes is to be avoided. Rear-mounted tractor fork-lifts would not appear to be as easy to operate as industrial trucks where the operator can look forward, but there is a great difference in capital cost.

Boxes in store

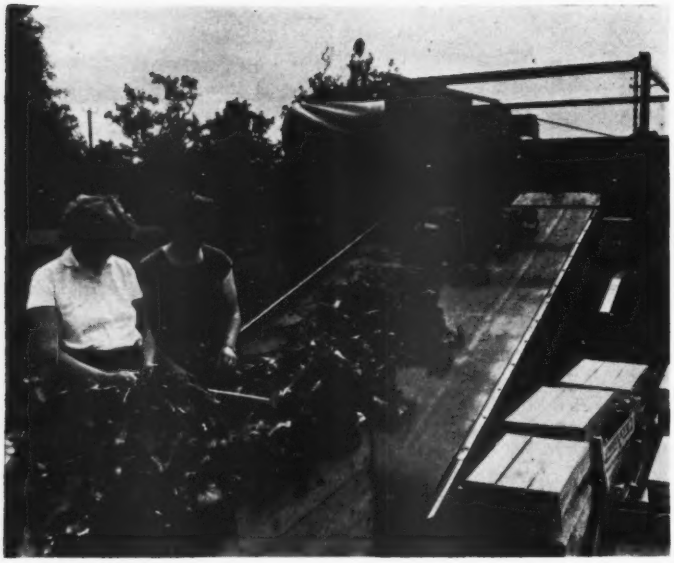
It also has to be remembered that a building to hold potatoes stored in boxes must provide at least 30 per cent greater capacity than a comparable bulk store, because of the space 'wasted' by the pallet bases, the actual box material and the need to provide reasonable access to the boxes. Some saving is made inasmuch as thrust-resistant walls are not required for a box store, but proportionately this is not great.

Location and storage of empty boxes is another consideration. This storage may well be a space in the open-air, unless additional expense on building cover is to be incurred. Where exposed to alternate high and low humidity, wood will swell and shrink, so causing the fasteners in the wood to come loose. It can also affect closely-fitted joints.

There is apparently more likelihood of moisture loss in a box store, and water worth £12 or more a ton cannot lightly be allowed to evaporate.

Box handling and short-term storage may be more economic for specialized applications. Packers and processors with high-volume operations, where the pallet boxes are frequently filled and emptied, may find such systems meet their needs. But for long-term ware storage on the farm, the costs of box storage look rather formidable and consequently should be approached cautiously.

This is the last of the three articles contributed by **Mr. J. H. Clift,** Regional Work Study Advisory Officer in the Yorks/Lancs Region of the N.A.A.S. The earlier articles appeared in our May and June issues.



Cut branches being fed to a BRUFF machine sited on the headland

Mechanizing the Blackcurrant Harvest

T. Laflin

THE considerations which have hastened the development of machines and methods for picking black currants are common to many horticultural crops—the difficulty of getting suitable people to do the job just when they are needed and the necessity to reduce costs to keep the margin between costs and returns at a profitable level. The difficulties with black currants are emphasized by the high labour need for picking over a very short period (about twelve pickers per acre for a 2 ton/acre crop) and the low price paid on the open market in the last two years.

Growers and engineers have thought about machine picking for a long time and, by 1961, two prototype pickers were well advanced in design. Both were designed to pick fruit from the conventional type of growing bush. In one case the fruit was shaken from the branches of the bush into a hopper beneath; in the other it was combed off into a small container attached to

the picking head. This approach had a number of disadvantages. Each picking head had to be individually powered and required an operator. The flexible drive or air line, whilst a minor difficulty, could be an embarrassment in a dense plantation of large bushes. Both pickers removed a number of leaves as well as fruit (calling for separation later) and the fruit had to be tipped from the container into which it was picked into another for marketing.

The principle of taking the crop into the machine instead of attempting to take it from the growing plant is applied to many crops. That which removes only the harvested crop from the field, as with cereals, is the most satisfactory if it can be done, but some picking mechanisms are better worked as static machines; peas, for example, are transported several miles to a static picker.

This principle was first applied to black currants at Luddington in 1962, when a shaker was used as a static headland machine, with cut branches fed to it for picking. The fruit fell, through a gentle blast of air which removed leaves and other debris, direct into market containers. The result was excellent.

This method solved all the engineer's problems mentioned above, but it raised many for the grower. Could black currants be grown satisfactorily and profitably if all fruiting wood were cut from the bush in July? The method of picking had sufficient advantages to make it worth while to look into the problems of growing currants in this way, and investigations were started at Luddington in 1962. Interested growers also experimented with the idea; in 1963 Efford E.H.S. looked at propagation and establishment problems; one machinery manufacturer developed his machine along these lines, and by the end of 1964 this new method of growing and picking showed enough promise to encourage further work and experience with it.

Trials with cutting

The first trials were with pruning methods at picking time and their effect on the bush and subsequent crops. One Herefordshire grower cut out about two-fifths of the fruiting wood for machine picking and finished the job by hand. This reduced picking costs and time, cut out further pruning and left enough wood in the bush to ensure a reasonable crop the following year. Until we have perfected something better, this is a useful approach for a grower to take, since it eases his picking problem and creates no growing difficulties. His crops are likely to be reasonable. Comparisons were made at Luddington between conventional bushes hand picked and mechanical picking from cut branches. Selective cutting of fruiting wood only, leaving young growths to fruit next year was one method which gave a crop each year. Cutting the complete bush to the ground (necessary if cutting were to be completely mechanized) was also done, giving a crop every other year. At conventional spacing, 10 ft $\times$ 4 ft, the results were interesting and have been consistent. Selective cutting, giving a crop each year, reduced the crop to half that of conventional bushes. Complete cutting down produced about the same crop as that from conventional bushes, but as it only comes once in two years, it was still equivalent to only half a crop.

In theory, if crop per bush is halved, double the number of bushes should maintain the crop per acre, but this does not always work out in practice. Dense planting also produces problems of weed control, spraying, cultivations and fertilizer application.

Growth made in autumn after cutting down bush completely for mechanical picking in July. Photographed in November. Variety: Baldwin

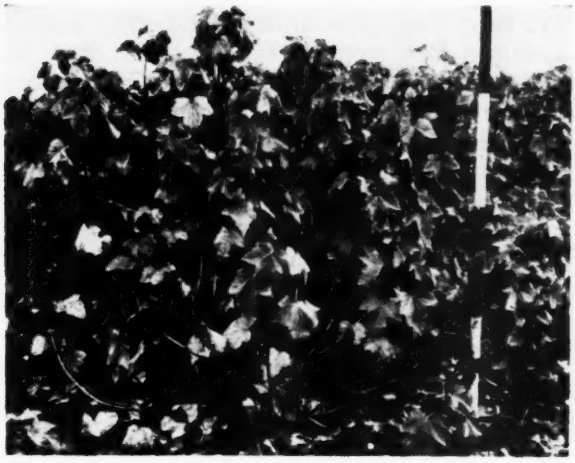
Bush spacings

The only thing to do was to try it, and a spacing trial with completely cut-down bushes was planted at Luddington in 1962. All combinations of inter-row spacings of 4, 6 and 8 ft and intra-row spacings of 2 and 4 ft have been used. Only one crop has been taken so far, but the results are most interesting. Crop per complete unit area increases with plant density, but, at the same density, a square plant is better than a non-square rectangle. This is consistent with Dr. Bleasdale's results with closely-spaced vegetable crops. But to make it possible to spray the plantation, close inter-row spacings have to be planted on a bed system, with an alley for the tractor at intervals throughout the area. This reduces the bush coverage, and the crop, to three-quarters or two-thirds that of the complete area. Allowing for this, the crops per acre obtained at Luddington last year were:

Spacing	Bushes/acre	Crop 1964, tons/acre
8 ft × 4 ft	1,361	4·45
6 ft × 4 ft	1,815	6·06
4 ft × 4 ft	2,042	5·40
8 ft × 2 ft	2,722	5·71
6 ft × 2 ft	3,630	7·47
4 ft × 2 ft	4,084	6·50

These crops have to be halved to get the mean annual crop, as cropping is only in alternate years.

If we look at the crop per bush, this decreases with an increase of bushes per acre, even though the number of fruiting branches is about the same in each bush, and although there is an increase in crop per acre with increasing density. This is important if a static machine, employing the cut-and-carry method, is used. The machine output is limited by the number of branches which can be carried to and fed into it more than by anything else. The greater the mean weight of fruit per branch, the higher the output of weight of fruit from the machine. If a 'combine harvester' is used, where speed of travel is probably the limiting factor, the high crop per acre is more important. We need far more information and a longer experience before the best spacings for different varieties and growing conditions can be recommended with confidence.



This photograph of the same bush, taken twelve months later, shows the further extension growth made in the year following cutting down

Bed systems accentuate spraying difficulties over the type of plant which allows tractor passage between each row, although the N.I.A.E. are looking at the problems of boom spraying as affected by black currants and the pests and diseases which attack them. High clearance machines might also offer a solution at all but the closest spacings. Application of chemical herbicides and long-lasting fertilizers immediately after cutting down for picking would probably be satisfactory, and we may have to look to application of nitrogen, either with irrigation water or as a foliar spray.

Alternate row system

There is an alternative to the bed system—where all the bushes are cut down in the same year—which eases the spraying problem. This is the alternate row system, where every other row, spaced at about 4 ft apart, is treated differently. Alternate rows cut down for picking in 1965 will be in the growth phase in 1966. The other rows would be cut down in 1966 and be in the growth phase in 1967, at which time alternate rows would be fruiting again and be cut down when ready for picking. If the row in the growth phase could be straddled by the tractor and spraying tank, each row could be sprayed easily by conventional means. The additional light and air movement reaching the fruiting bushes might also be an advantage. A comparison of the two systems is needed, and this will be done at Luddington and Stockbridge House E.H.S.'s and on growers' holdings.

High density planting

The large numbers of plants needed for high density planting, whether in beds or in an alternate row system, will create propagation and establishment problems. Cuttings for direct planting are cheaper than bushes and can be more easily planted mechanically. Comparisons of performance of plantations established from cuttings and bushes of different ages are being made at Efford E.H.S. They are also looking at different times of planting the cuttings, in case it should prove practicable to plant the wood which has passed through a picking machine. Particular care will be needed to maintain the health of parent material from which the cuttings are taken, and this

will be of first importance if the healthy planting material so essential to sustained high cropping is to be used. Stool beds of a high standard of health will be a better source of cuttings than the fruiting plantations.

Plantations established from cuttings yield smaller crops in the early years than when bushes are planted. To compensate for this we have thought of very close planting of cuttings, say 1 ft square, and then thinning the plantation by rotavation after two to four years, having taken one or two crops. If cropping is high enough in these early years, we might even treat the crop as a very short-term perennial one. These methods are also being tried in several places.

Towards complete mechanization

To summarize the position, machine picking of black currants offers a means of reducing production costs to enable the crop to be grown at a reasonable level of profit, provided high yields can be obtained. Should the fixed picking mechanism, either as a static or mobile machine, become generally used, an entirely different method of growing will have to be adopted. This raises problems of establishment, spacing, pruning, nutrition, weed control and pest and disease control, which still have to be solved. A likely method is closely spaced bushes, established from direct planted cuttings, grown in beds or alternate rows. Cropping will only be in alternate years, since the bushes will be cut to the ground at picking time. Herbicides and fertilizers, except for nitrogen, might be applied by conventional means in alternate years immediately after harvesting. Spray materials and nitrogen might be applied by overhead boom sprayers (or by conventional means with alternate row system) as necessary.

Ideally, harvesting will be completely mechanized, the machine including a cutter, elevator, picker and branch shredder, so that only the picked fruit will be carried from the plantation. Evolution of such a method, should it be possible, will take a number of years, but the programme of work necessary for it is well under way. For the time being, growers may well introduce picking machinery on to their holdings without radically altering their growing methods. This would allow them to cut out and machine pick about half the fruiting wood from each bush, picking the remainder by hand. At the same time they could well establish small areas for complete mechanical picking on one of the two systems which show most promise. In this way the risks are not too great and their experiences with the new methods on a small scale will expose their problems and indicate the lines of work necessary to solve them.

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Pigs on Show

Lt. Cmdr. J. A. Darley

is interviewed by

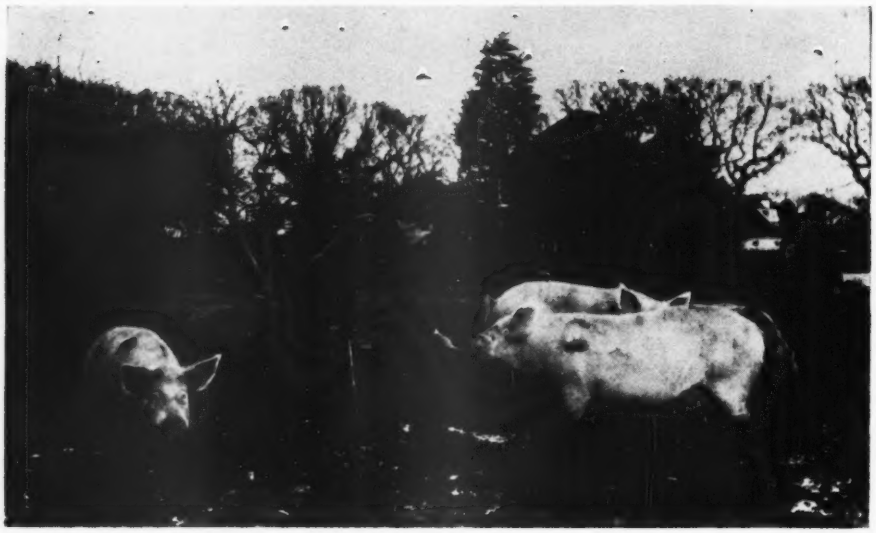
Norman Goodland

THE policy of the Pig Industry Development Association has had a profound effect on the pig show-ring. Its emphasis upon the commercial carcass—food conversion, time to reach marketing weight, prolificacy, and so forth—has made the work of the show judge of less importance. One may have a beautiful two-year-old sow or boar in the show-ring, a worthy champion of the breed, but without any real means of knowing its growth rate in its earlier days or any of those inherited qualities which might make it an attractive commercial proposition. Hence many breeders have been testing at the National Progeny Testing Station, at Walls, BOCM, and other testing stations, and then selling their breeding stock on the merits of this testing, rather than on the merits of their appearances at shows.

Another deterrent to the pedigree breeder to show his pigs lies in the fact that the prizes offered nowadays, even at the big shows, lag more and more behind the mounting costs. Transport, staff, special accommodation on the farm, are all becoming so expensive that even if the breeder succeeds, the whole effort has been hardly worth his while. Over the past three or four years fewer and fewer breeders have found showing to be a paying proposition. There is also the matter of swine fever restrictions at the testing stations.

Why show?

Lt. Cmdr. J. A. DARLEY, a leading figure in the pig world, owner of the fourteen-year-old Silverland Herd of pedigree Large Whites, New Milton, in Hampshire, has brought these points to my attention. He said that these restrictions are such that no one is allowed to take stock to a show within one month of testing. Animals are not allowed to come on to one's farm from



Lt. Cmdr. Darley with his breeding sows.
Show conditions are not the only consideration

outside within a month of taking stock to test at the National Testing Station. In view of the fact that the 'elite' and the 'accredited' herd system is likely to be brought into operation on the 1st April next year, anybody who is proposing to be 'elite' or 'accredited' will not be able to test their stock within a month of showing. It follows from this that as far as testing of stock is concerned it can take place only in the winter months. This, of course, restricts to a very few animals the number of stock to which boars can be put for progeny testing. Commander Darley has 60–65 breeding sows, but even with this number, he says he would find it extremely difficult to test and show at the same time.

So it will mean that those people who risk the financial hazards of the show-ring will be severely limited in the amount of testing they can do, and the overall position can have a profound effect on entries to the shows. In such circumstances one might well ask what is the point of the show-ring for pigs?

Commander Darley is the Chairman of the Pigs Committee of the New Forest Show Society, with which he has been connected for twelve years. He is also a member of the Executive—so he is in a good position to answer this question. He says that even looking at it from traditional standards, there remain two very important points in favour of the show-ring. One is that we are still looked to as a stockbed for Europe and the world. Our shows, particularly the Royal shows, are shop windows for foreign delegations coming to buy stock; to take away the pig show-ring would certainly be a retrograde step.

The other point is, he says, that strict attention to the commercial carcass is all very well, and very necessary, but it has to walk about and live and stand up to conditions on the farm, which in some cases are rugged indeed. The Testing Station remarks only on leg conformation; it gives no information as to how the animal knits together or how strong or how suitable it might be to a prospective buyer's farm, management, methods or conditions.

Ideas from the New Forest Show Society

Commander Darley agrees, however, that these conditions alone are not sufficient to keep the pig show-ring healthy—essential though they may be. What is needed is an endeavour by Show Societies to come into line with commercial requirements. He believes that the New Forest Show Society, as one of the largest promoters of one-day shows, is a pioneer in this respect, and described what his Committee recommended and what the Society has agreed to. But he pointed out that this was not just a sentimental saving of the pig show-ring; a great deal of thought has gone into the matter and it was being undertaken because the New Forest Society believes that the pig show-ring, properly handled to suit modern conditions, still has excellent service to offer the pig industry generally.

First, to make the show-ring worth while. There is a shifting emphasis towards the commercial classes. Breed classes are cut to two—young boars and young gilts. The money thus saved is for the increase of prizes for the three main commercial classes—heavy hog, bacon and pork pig. These classes are to be judged on an aggregate points system; if an exhibitor wishes to go in for the live class, he will have to enter the carcass class as well. This, of course, means a refrigerator van for pork. The winner on aggregate points will receive prizes of £20, £10 and £5 or £3.

Besides this, it has been decided that an exhibitor with a high number of aggregate points whose exhibit is sired by a progeny-tested boar of above average standard by the national rating system, will receive a further prize of £5, £3, £2 and £1. There will also be a local prize of £5, £3, £2 and £1. A local man will, therefore, stand to get a total first prize of £30.

This is the new approach which Commander Darley thought will encourage the commercial man to show his pigs, and such a method will certainly enhance the interest of foreign buyers. There will obviously be real *commercial* advantage in coming to see how these classes do, and in buying from breeder and weaner producers who in fact get high marks in the aggregate marks system.

To make the new system possible, a special Society earmark is put into non-pedigree pigs being entered for the Show, at between 55 and 65 lb live weight. This applies to all three classes. This means that a commercial man who fattens pigs or is a weaner breeder can match his stock against the best breeders in the country. Earmarking pigs on commercial farms is not a simple process, but it is being supervised by the PIDA officers of the Southern, the South-Eastern and the South-Western regions within a radius of 50 miles of the Show.

CHESHIRE points the way to

More Profitable Milk

Alec Calder

MILK is still very much to the forefront in Cheshire. Here new techniques and the harnessing of research work—particularly in grassland—have brought a new look and improved prosperity to many dairy herds. Cheshire has, of course, been a dairying county from time immemorial, and it is therefore natural that its farmers should seek methods of improving the profitability of their herds rather than look for alternative ways of farming their land.

The new ideas being adopted revolve around reducing the costs of production, particularly feed and labour charges. At the same time increases in herd size, made possible by intensive grassland techniques, have stepped up the intensity of stocking even beyond the usual high Cheshire level. All these developments spring from the realization that grass, managed intensively, is the cheapest food for the dairy cow—at least under Cheshire conditions.

At one time the county was an area of high cake feeding. These were the days when imported maize could be bought for as little as £6 a ton, and with the docks and mills of Merseyside on its doorstep, there was justification for such a policy. Cake use would average 4 lb for every gallon produced—more on some farms. Today, concentrate use is down to as low as 1½ lb per gallon in many cases. Moreover, the concentrate is frequently barley or a weak barley-protein mix costing little more than 24*s*. per cwt.

More nitrogen being used

In summer, intensive grazing behind an electric fence has either made it possible to cut out concentrates entirely or at least reduce them to a very low level. On some farms treacle drippers have been installed to encourage cows into the parlour and offer a palatable means of feeding minerals. Winter feeding on the more progressive farms usually involves the feeding of silage. Both easy-feed behind a feed fence and *ad lib.* systems are popular. In the early days of self-feeding it was not uncommon for the silage to run out in late winter. Now, with more intensive use of nitrogen on grass, silage supplies are often more than adequate. The increasing use of nitrogen has been one of the more significant developments in Cheshire in the past few years. A N.A.A.S. Grassland Recording Scheme showed that many farms were using an average of around 100 units per acre and tending to increase their dressings annually. Some pioneers are now putting on over 200 units and still find additional amounts economic.

Self-feeding of silage was once regarded as a low cost–low yield system of milk production. But a full understanding of the Hurley research work on grass digestibility has led many farmers to cut earlier for silage. The result—a better quality product has made yields of 900 gallons, with a concentrate use of 1·5 lb per gallon, commonplace. Several herds are now achieving over 1,000 gallons at low concentrate use on self-feeding systems.

Pushing up the gross margin

Performances of this order easily leave a margin of over £100 of milk income over the cost of concentrates. Such a figure, when coupled with stocking rates of 1½ acres per cow and higher, can mean only one thing—high gross margins on the grass acres. In many parts of the country a figure of £35 or £40 per acre may well be taken as a reasonable gross margin for cows. Some Cheshire farms are in the £60–70 region, despite increases in fertilizer cost from, say, 30*s.* to £6 per acre.

But greater gross margins are only one side of the picture. Overhead costs have been rising steadily over a number of years. Many farms have taken steps to reduce, or at least stabilize, labour costs in particular. The modernization of farm buildings has gone a long way in Cheshire, particularly on the larger farms. The old cross-tie shippons, so familiar in Cheshire a generation ago, have now given place to loose housing. Cubicles abound, as well they might in the county that pioneered them. Herringbone milking parlours and bulk tanks are also highly popular. All have played their part in either reducing labour costs or enabling the same farm staff to look after more cows. The 50-cow herd has now probably grown to 60 and is tending to increase towards 70. The 100-cow herd has become one of 120, and again is still increasing.

Low concentrate use, high yields, high nitrogen use, high stocking rates, herringbone parlours, bulk tanks and cubicles are the signposts to profitable dairying now being followed in Cheshire.

The author of this article, **Alec Calder, N.D.A.,** is a District Advisory Officer of the National Agricultural Advisory Service in Cheshire.

Birds killing-out at 5-8½ lb at 11-12 weeks old could be a profitable fill-in crop

says

M. C. Morgan

Tiny Turkeys

THE turkey industry has had a good many changes during the past ten years. Not the least of these has been in the bird itself. The old, high-breasted carcass which, when on a plate, resembled the upturned keel of a boat, has been replaced by the much broader-breasted and heavily-fleshed bird—so much more attractive to the housewife, whether it be fresh or frozen, and ready for the oven.

This new bird is far more efficient in its food conversion and grows much more quickly than did its predecessor. It can be killed at a very early age and yet will give a well-fleshed carcass that will sell well in competition with the larger broilers and capons.

Every effort is being made to popularize the sale of turkey all the year round and, to meet the demand of the small family, turkey breeders and fatteners are doing their best to produce a tailor-made product.

If all the turkeys which the national breeding flock is now capable of producing were marketed at Christmas the situation would be chaotic. Thus, as the industry has grown, more and more birds have been produced so-called out of season. The greater the number which can be sold to the consumer immediately the better, because a large number are killed, processed and put into cold storage for release as and when required, and certainly for the Christmas trade.

The popular bird

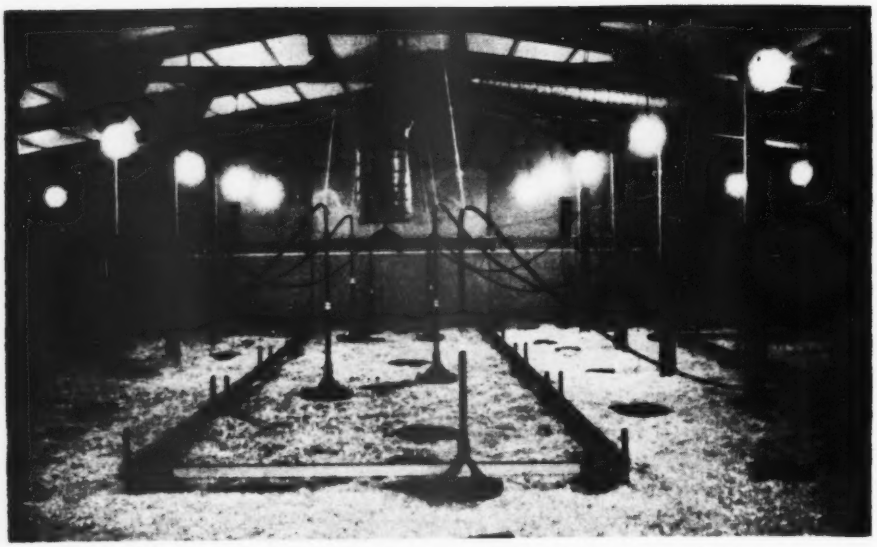
The popular weight range for the Christmas bird is 10–14 lb, with a limited demand for heavier birds for bigger households and a healthy demand for big birds to meet the needs of the catering trade. The tiny turkey will yield a carcass of 5–8½ lb only. It is killed at about 11–12 weeks old and the live weight of the males will be in the region of 10 lb and the females 8½ lb. At this age there is little or no difference in the conversion efficiency of the sexes, which should be 2½ lb of food consumed to each lb of meat produced. The position changes later in life, when the males become considerably more efficient than the females.

The period of peak demand for day-old poults for fattening has changed over the years and the demand for turkeys by the average family has increased. Turkeys normally come into lay with the lengthening days and are at peak production in April. Nowadays, with our quick-growing, massive strains, July, August and even September are months of high demand. Increasing knowledge of the effect of light on ovulation has enabled the breeder to so control his stock that eggs will be produced when they are required, by bringing into lay different colonies of breeding hens. To do this he needs accommodation for his stock in which he can expose the birds to varying light patterns. When these houses are not in use by the breeding stock they are ideal for producing the tiny turkey.

In many cases too there is considerable brooding and processing equipment which otherwise would be standing idle. A 'fill-in crop' of small birds also helps to provide regular work for the skilled labour force.

Production hints and problems

The body conformation of turkey males is such that they have difficulty in mating naturally. Artificial insemination is therefore frequently practised in order to obtain poults in economical numbers. The cost of the initial poult is particularly important in tiny turkey production, because it represents a proportionately larger part of the total cost than is the case with the heavier bird. This does not necessarily mean that a cheap poult is automatically more profitable than a dear one. It must be capable of the necessary quick growth and efficient food conversion. Specialist breeders must nevertheless try to produce an economical poult. To do this they aim at a good egg-laying strain of female and then mate with a male from a line showing exceptionally good growth and conformation at the age at which the progeny are to be killed. Too often fatteners are lured into keeping on the tiny turkey, tailored for the job, to meet a demand for bigger birds and are disappointed



A house ready for the poults, which will be enclosed in circlets, each containing about 300 birds. Note the automatic feeder and hot-air trunking

because they are not efficient at that age, either by virtue of poorer conformation or inefficient food conversion, or both.

This very small turkey should be reared intensively; ideally it should be managed under one system only. Any change in brooding methods can result in a check in growth. Floor brooding is therefore popularly practised by specialists in this trade. The use of tier brooders for three weeks and then a change to floor rearing is, however, common practice.

The standard of management must be high if the best results are to be obtained. The floor space allowed should be about 2 sq. ft per bird at 11–12 weeks of age, and in the early stages generous trough space must be given and the troughs must be well lighted, particularly during the first few days. By eight weeks, however, 1½–2 in. of trough space per bird is adequate.

It is extremely important to feed tiny turkeys correctly; they must be grown quickly and without checks. There is no stage at which the ration can be cheapened. They should be 'finished' as well as possible, and fat included in the ration helps to achieve this object. A further aid is to caponize the birds about three weeks before killing; this helps to put that layer of fat under the skin which constitutes 'finish'.

Respiratory diseases are of very real concern to the turkey grower, and it is very necessary to guard against them. Overcrowding in badly ventilated houses is a major contributory factor. The recommended ventilation requirements for this class of bird are difficult to assess, but in winter a rate of 1½ c.f.m. per 1 lb body weight seems to be adequate, with possibly a little more during the warmer, summer weather. Clean, dry litter is essential—and soft wood shavings are ideal.

Great care must be taken in preparing the birds for slaughter. They are very young and therefore easily bruised in handling. It is all too easy to wipe away the profit margin by rough treatment at this stage, with the resultant down-grading at the processing plant.

The bird for the job

The white turkey is ideal for this trade, and is becoming increasingly popular in this country. Bronze birds killed at 11–12 weeks tend to have dark pin feathers still in the skin, particularly on the back. These are unsightly and should be removed during processing.

The tiny turkey is expensive to produce and can be profitable only if a high degree of efficiency exists. It must be remembered that as the poult represents a higher proportion of the cost of production in this tiny turkey, so do the brooding and processing costs. All these charges can be spread over a larger poundage in the bigger birds. Whilst the profit margin may be small, volume production can make it worth while. Tiny turkey production has helped the breeder, fattener and processor to extend his season and so make maximum use of plant, equipment and labour.

M. C. Morgan, N.D.P., has recently been appointed N.A.A.S. Turkey Specialist and works from the West Midland Regional Headquarters at Wolverhampton. He served as County Poultry Officer in Pembrokeshire, Norfolk and Devon, and then became Director of the Wheaton-Aston Poultry Testing Station. Before taking up his present post he went on a fact-finding tour of turkey enterprises and educational centres in the U.S.A.

Lifting of Heavy Weights

EMPLOYERS of agricultural workers are reminded that from 1st July the maximum weight of a sack or bag, and its contents, which a worker employed in agriculture may lift or carry unaided, is 180 lb. This is the effect of the Agriculture (Lifting of Heavy Weights) Regulations 1959 which came into force on that date.

These regulations do not affect the existing provision in the Agriculture (Safety, Health and Welfare Provisions) Act 1956 that a worker under 18 years must not lift, carry or move a weight so heavy that it might injure him.

Follow-on piggery

for sows and litters

H. HOLLINRAKE

WHERE farrowing crates, fixed or permanent, are used, accommodation has still to be provided to take the sow and litter to the weaning stage and the litter to a stage when they can be moved into a fattening house. This usually means two further sets of buildings, adding considerably to the amount of capital laid out. A conventional follow-on pen with creep accommodation is likely to cost £150 to £200 per pen, and further pens for weaners could add a similar amount again. Such expenditure not only puts a big strain on available capital, but continues to add to the already heavy cost of providing all the other types of houses required in a pig enterprise.

These were the considerations in mind when the A.L.S. were assisting in the design of new farrowing pens for the East Anglian Real Property Co., of Cantley, Norfolk. Experience on other enterprises had shown that sows and litters could be grouped successfully, and a building was considered on this principle as the first stage in reducing costs. With this in mind, could such a building be designed much more simply than the more usual pitched-roof, brick-enclosed building?

The diagram opposite shows the simple design finally arrived at. An open front! Would it be too cold? The cost was estimated at about £50 per sow, for six yards taking in all thirty sows. This low estimate was too tempting to ignore, and a range of this size was erected in the autumn of 1962, the actual cost being £1,484. It was in use during the very cold winter of 1962–63 and has continued in use to date.

The results have been excellent, with no sign of setback when the sow and litter are moved in two weeks after farrowing, from a very well insulated 'maternity' house. The average weight at eight weeks is over 40 lb.

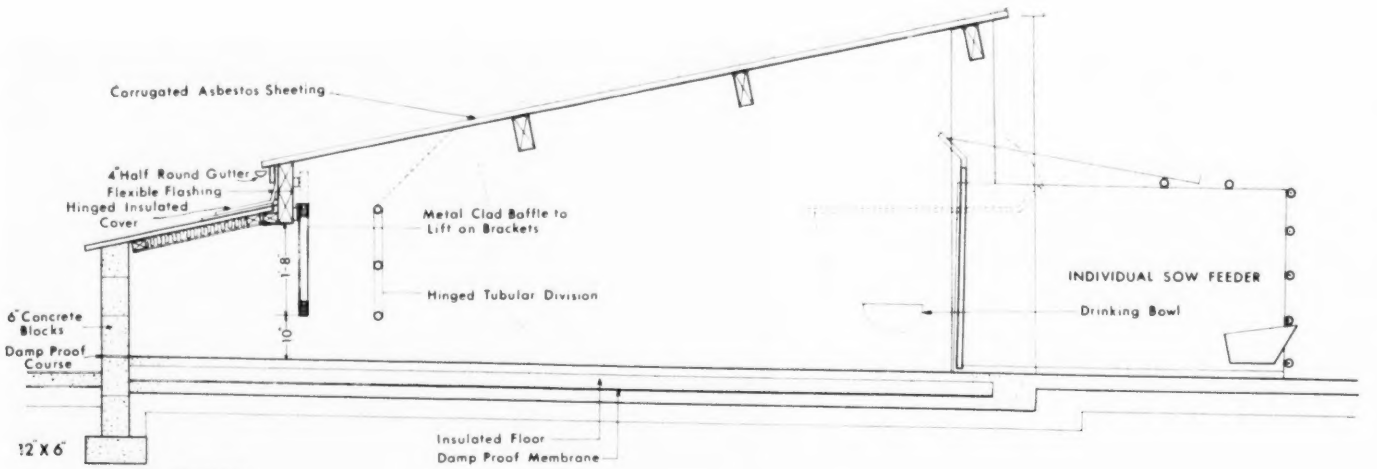
As the pens were to be open fronted, it was decided to heavily insulate the creep lids and use a front board of solid construction; a suitable temperature is, therefore, easy to maintain using two 400-watt heat lamps for the first week or so, or in very cold weather, and replacing them with two 200-watt lamps for the later period and for summer use. The creeps were specifically designed to be accessible without the pigmen having to go through the pen.

To give the young pigs a little more space clear of the sows than the creep affords, a second tubular division across the pen adds a further 18 inches.

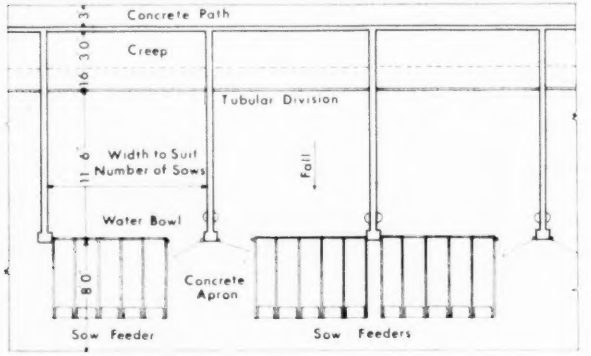
The whole of the floor has a deep straw bedding; movable individual feeders (extra to the above costs) with a permanent gate, cover the front of the pens. This allows mechanical cleaning of the pens between batches of pigs.

Weaning normally takes place on this farm at 6–7 weeks. The litters are kept in the pens until the fattening house has accommodation available.

The farm manager considers that the sows' water-bowl could with advantage be positioned a further 18 inches inside the pen. This could reduce the amount of dung that accumulates near the gate. He also thinks that in future buildings he would lay water to each creep.



CROSS SECTION



PLAN

J. A. H. Nicholson

shows how some very simple additional records can help a grower and his adviser to check on the performance of a tomato crop and to spot possible ways of increasing profitability in future years. Similar principles apply to the management of other crops on the nursery

Growing tomatoes without guesswork

WHEN the financial results of tomato growing in any area are examined, it is found that there are marked differences in the performance of the most and least successful crops. To some extent these variations are to be expected. The crop is grown on nurseries of many sizes and in glasshouses of various kinds. And where the houses are heated, a wide range of installations is in use. The crop makes varying contributions to the economy of the nurseries on which it is grown: some tomatoes are produced as highly-specialized mono-crops; others are humble catch-crops. A wide choice of husbandry and marketing practices faces the grower. Yet even where crops are produced under conditions that are essentially similar, the variations in profitability between holdings are still pronounced. There is no escaping the conclusion that higher levels of management and organization on many nurseries would increase growers' incomes.

At the time of writing, representatives of the growers and the Government are conducting the first of the periodic examinations of the horticultural industry. Tomatoes are the typical glasshouse product under review. Doubtless many growers will still be looking to these discussions for stronger measures of price support for the industry, but it is to be hoped that the current negotiations will not distract growers' attention from problems which lie *on their nurseries* and are their responsibility alone.

Growers are able to turn to the N.A.A.S. for advice on raising the level of income in their businesses. A starting point in such case-studies is the examination of financial and physical records of the crops which have been grown in recent years. Unfortunately, many of the growers who seek management advice are not in a position to provide any information more detailed than that which is included in their annual revenue accounts. Unless the holding only carries one crop, these accounts are of limited value for management purposes, although they are doubtless satisfactory for negotiations with the Inland Revenue.

Grower's diary

It has often been my experience in horticultural management advisory work that growers cannot even provide a list of the crops produced in the last year and the areas of each. Such elementary information is obviously essential if very much progress is to be made: a simple diary is a convenient form of record for this purpose. For each glasshouse crop, dates of seed sowing, planting out, first and last marketing, and the use of heat are all useful indicators of technique. Temperature regimes, where any control over these is possible, can conveniently be noted here.

With tomatoes, the relationship between the date of planting and the date of the first marketing may be illuminating, as the following illustration shows. (This example and another below are quoted from a recently published report on the writer's work in the East Midlands.*)

When records of tomato crops grown in 1962 were examined it was found that several had been planted in the week beginning 6th March. From one of these crops, fruit was marketed first in the week beginning 15th May: two of the crops were not picked over until the week beginning 10th July. Further examination showed that the earliest crop had been grown with an efficient hot water system, the boiler being fired with washed singles which were stoked automatically. The grower had used his heating system throughout the season and his crop was cleared away for chrysanthemum cuttings to be planted only two weeks after the two late crops could first be marketed. These crops, by contrast, were grown in houses equipped with large-bore pipes, hand-fired boilers (burning coke) and no circulating equipment: no pipe heat was given after the end of April in one case and the end of May in the other.

In purely *husbandry* terms, there is a strong suggestion in this information that the early grower was making good use of his heating system and glasshouses, whereas the others were not. It is likely that by planting later, say in early April, by planting a more mature plant, and by burning at least as much coke, these growers could still succeed in picking fruit in early July without significant loss of earliness. Later planting would create an opportunity for a crop to be added to the succession or for chemical sterilization to be undertaken. It must be emphasized that the above argument does not necessarily imply that these two late growers' *economic* decisions in 1962 were incorrect. But the illustration does show how the simplest records may highlight practices which require careful economic appraisal.

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*Nicholson, J. A. H., *Management of Heated Glasshouse Tomatoes*, F.R. No. 156, University of Nottingham, Department of Agricultural Economics, 1964, 4*s.* 6*d.*

Gross output, prices and yield

The most useful of all crop records are those concerning gross output, prices and yield. They collect together information on the value and weight of the crop and the prices obtained. Much of the record-keeping is done for the grower in the course of transactions with commission salesmen or local shops, but where produce is retailed off the nursery the grower will need to make daily notes of the quantities sold and the prices realized.

The first use of these records is for an appraisal of the efficiency of the grower's methods by his N.A.A.S. officer, who can be invited to compare them with the local standards. Weaknesses in the level of gross output may be located either in low yield or low prices or both, and some remedial action should be possible in future years. This is not to suggest that any individual grower can prevent his prices falling along with all other growers' prices, but it may be possible to correct low quality in the fruit and malpractices in presentation. Increased earliness and heavier cropping through better husbandry seem obviously practicable when many growers' records are examined.

Three difficulties will be apparent in the interpretation of these records. It is well known that tomato prices display a downward trend through the greater part of the marketing season of home-grown produce: different levels of prices are obtained by selling through the various types of market outlet: growers choose to plant and to clear their crops over a great variety of dates.

Monthly records

For his part, the adviser will attempt to use standards which relate to a marketing season and method similar to that under review. The grower can greatly aid a more enlightened appraisal by providing records of a *monthly* nature, such as those shown on page 351.

Where monthly yield records are available, the distribution of the crop through the season is evident. The adviser will be concerned both with the extent to which the crop 'bulks up' early and to which heavy cropping is maintained to the close of the season: both these factors are desirable for profitable production and can be controlled by good husbandry.

These points are illustrated in the table in which columns 1 and 2 show the type of information available to the N.A.A.S. for use as advisory standards. Column 1 depicts average results of six early crops sold by *commission* in East Midland markets in 1962. Column 2 shows the results of the most profitable of these crops.

What can be said about the management of the crop in column 3?

Up to the end of July gross output was above average, and up to the end of June it was in fact higher than that realized by the best crop. There is no obvious cause for comment on the prices realized by this crop. Yield to the end of July was about average, and up to the end of June it also exceeded the performance of the best crop. Although cumulative gross output and yield to the end of July were inferior to the best crop, it was found in fact that the example in column 3 was stopped at five trusses.

Thus there is little scope for criticism in this case, although a glance at the whole season totals of gross output and yield might give a very different impression.

EARLY TOMATO CROPS IN 1962: Monthly Record

(All numbers are expressed in decimals)

	1	*2*	*3*
GROSS OUTPUT per 1,000 sq. ft	£	£	£
April	1·6	—	—
May	40·5	18·5	6·4
June	79·8	100·4	125·5
July	53·7	110·0	59·0
August	15·8	37·0	—
September	3·6	—	—
October	1·2	—	—
WHOLE SEASON	196·2	265·9	190·9
AVERAGE PRICES per 12 lb tray	£	£	£
April	2·4	—	—
May	1·5	1·9	1·6
June	1·3	1·4	1·4
July	0·9	1·0	1·1
August	0·7	0·7	—
September	0·4	—	—
October	0·4	—	—
WHOLE SEASON	1·0	1·1	1·3
YIELD: 12 lb trays per 1,000 sq. ft	Number	Number	Number
April	0·7	—	—
May	27·0	9·7	3·9
June	63·2	71·3	92·3
July	62·9	113·3	54·3
August	24·2	55·0	—
September	8·7	—	—
October	3·4	—	—
WHOLE SEASON	190·1	249·3	150·5

NOTES: Average prices are net of commission, handling and haulage charges.

Gross outputs are the monthly or total sales of the crops, net of the above deductions.

A further aspect of management—at least as important as analysis—is *budgeting*. Monthly records of gross output are particularly useful in this connection where decisions on successional cropping must be reached. Another important use of gross output data arises when crop planning is undertaken in the absence of detailed costings. The levels of gross output give a crude guide to the respective profitability of a range of crops.

This article has stressed the management advisory role of the N.A.A.S. by explaining the use which advisers can make of very simple crop records in checking past methods and planning forward. Costings, which are the next stage in record keeping, have not been considered. Because records substitute information for intuition, they must be seen as a constructive step forward in any horticultural business, but particularly where tomatoes are grown.

J. A. H. Nicholson, B.Sc.(Hort.), is Horticultural Management Liaison Officer in the Department of Economics, Wye College. He previously held a similar post at the University of Nottingham.

DERBY

'full of meat and wholesome'

R. Scott

CHEESE recipes from the Continent seem to have been brought to England by two main routes. Those by the southern route, from France to Devon and Wiltshire, affected 'lowland' cheese; those by the northern route, from the Netherlands and Scandinavian countries, via Yorkshire and Northumberland, affected the 'Dales' cheese. Inevitably, the recipes were altered to suit local conditions and local preference for flavour. Thus each separate area of the country developed its own local cheese. Many of these cheeses have disappeared, some because the flavour of the cheese was not palatable; some because the system of dairying changed in character (e.g., liquid milk selling was an attraction since it provided immediate cash payment). The recipes themselves have also undergone many changes—and indeed, are still changing—so making it impossible to give a fixed recipe for any cheese over a long period. Not least, the quality of milk has a great bearing on the cheese recipe used.

Derby cheese evolved mainly in the valleys of the Trent and its tributaries, and was made from the milk of Shorthorns, including the Blue Albion. Often described as 'full of meat and wholesome', it was in good demand by manual workers in the nearby heavy industries of pottery, iron and steel, and coal mining.

When well ripened, the cheese proved just as acceptable on the connoisseur's table as in the cottage kitchen. Indeed, one of the good points about Derby cheese is that it has no pronounced qualities, such as strong flavour. But it is also true that this very fact has prevented the cheese from gaining more widespread popularity.

The recipes, handed down secretly from generation to generation for many years, were occasionally influenced by new ideas from outside the area. Thus at Youlgrave one farmer introduced a two-curd system, more like Lancashire cheese, in an attempt to give it a more acid flavour. But such innovations did not last long; the Staffordshire, Warwick and Peakland cheeses, which resembled Derby, have all disappeared.

Salting the curd

Traditional and variations

The traditional Derby cheese was produced in two main types. One in spring, when milk quality is normally lower, was made to ripen quickly for sale in six to eight weeks. The second type was made in summer and autumn from better quality milk so that it would mature more slowly and develop the characteristic marked nutty flavour. It was from these longer-keeping varieties that the yellow (annatto) coloured Derby cheese, and the sage-flavoured cheese were developed. The coloured Derby cheese was an obvious imitation of the coloured Cheshire, although some deeper-coloured cheeses were made for the Leicester market.

A sage-flavoured cheese was made for the Christmas trade. In this case the curd was either treated with crushed sage leaf extract to give the sage flavour to all the cheese, or to layered bands of curd (one or two) put in the cheese at the time of manufacture. Since the sage leaf extract is brown-green in colour and bleaches during ripening, some green neutral colour, such as wheat-leaf extract or kale-leaf extract, was added to provide a pleasant green colour in the ripened cheese. Today one finds whole crushed sage in some cheese, with bright green synthetic colouring, or even sage oil plus bright green synthetic colour to simulate the real flavours. Such is progress—or is it? Many of the skilled craftswomen cheesemakers would decorate the rind of the sage cheese with traditional patterns made up in sage leaves for a festive table.

In the making

The Derby cheesemaker used brass or copper kettles for warming milk or whey. The vats were wooden-sided, and a separate drainer at a convenient level was used for maturing the curd. Wooden cheese moulds with split bands inserted were used to allow shrinkage of the curd. The cheeses were thus pressed by stone weights or pole lever presses, often placed near the fireplace to receive warmth at night. The cheeses originally weighed 25–30 lb, were of 14–16 in. diameter, and 3–4 in. deep. A circular bandage only was used as support. A paper cap was ironed on with a hot flat iron to produce a thin, hard surface coat for protection. Technologically, the Derby cheese process was far in advance of that for other cheese, and it comes as no surprise that the first cheese factories in this country were for Derby cheese.

Farmers' wives and daughters carried the burden of cheesemaking, but when the railways drove through the heart of Derbyshire from London to Manchester and the North, markets for liquid milk were opened. At about the same time the Duke of Devonshire, as a large landowner, encouraged the farmers to think of collective marketing. The aims of these collective operations were to get greater uniformity of produce, to relieve the farmers' wives of toil, and to enhance the value of dairying as a farming operation.

The first collective factory was sited at Derby, but new cheese factories were opened shortly after at Longford (1870), and Windley. Cheese factories had been long established in the U.S.A. by this time, and it is not surprising that the brothers Schemerhorn came from America with ideas to operate these first two factories at Derby and Longford. Co-operating farmers' organizations eventually opened factories at Brailsford, Willington, Reapsmoor, Gratton and Glutton Bridge. Some idea of the amount of milk handled in these enterprises comes from the accounts of Longford Dairy in 1870, which showed sales of over 61 tons of cheese—the equivalent of upwards of 140,000 gallons of milk.

Move to the south-west

Due to changes in the patterns of milk production and distribution, many of these factories have now disappeared. What, then, of the position of Derby cheese today?

Very few cheeses are made in the traditional area. The similarity between Derby cheese and the quick-ripening Cheddar, together with the desire to keep a number of different English cheeses on the market, has stimulated creameries in the south-west of England to take up the manufacture of Derby cheese, alongside Cheddar and Caerphilly.

The usual method of manufacture of traditionally coated cheese requires the milk (pasteurized) to be set at 84°F with 4 oz rennet per 100 gallons after the addition of $\frac{3}{4}$ per cent of starter. Since the cheese is a sweet one, growth of starter is curtailed to half an hour or until there is a rise of 0·03 per cent acidity as lactic acid. The modern maker may use 2 per cent of starter and rennet immediately. The curd should be cut when firm enough to give a clear whey—within about 45 minutes. Four cuts are made with half-inch knives to produce large pieces of curd. Then scalding is completed in one hour at a temperature of 96–98°F. The curd is matted, just as in the Cheddar process, and when an acidity of 0·45–0·5 per cent is reached, the curd is milled, salted, and put in the press. The pressing continues for twenty-four hours at a pressure increasing from 5 cwt to 30 cwt.

The ripening process takes from four weeks to six or eight months, by which time the body is quite firm, the texture close, and the flavour distinctly nutty, clean, and not too acid. The traditional Derby cheese is made to lose 6–8 per cent moisture during the ripening process. Because of the modern practice of film wrapping of rindless cheese, the moisture content has to be reduced to its final percentage at the time of manufacture, otherwise moisture and gases produced during ripening would be retained by the wrapping. The block film-wrapped Derby cheese of today therefore ripens slightly differently from the traditional cheese, but it still produces a pleasantly edible product. Since the flavour of the Derby cheese is normally mild, this cheese is better suited to the newer technological developments in packaging than the stronger-flavoured varieties like Cheddar.

Sage Derby cheese is also made in small quantities. The coloured cheese finds a very small market, but normal Derby cheese is worthy of a place on any table.

R. Scott, B.Sc., N.D.A., N.D.D., has had many years' experience in the dairy industry and as a university lecturer. Previously Head of the Dairy Section at the School of Agriculture, Sutton Bonington, and now Senior Lecturer in dairying at the University of Reading, he has always been greatly interested in cheese and cheesemaking, and has been judge in these subjects at various shows.

The Ministry's Publications

Since the list published in the June, 1965, issue of *Agriculture* (p. 311), the following publications have been issued.

BULLETINS

No. 69. Onions and Related Crops (Revised) 3*s.* 6*d.* (by post 3*s.* 11*d.*)

Describes varieties, preparation, cultivation, harvesting, storing and marketing of these vegetables. There are also sections on diseases and pests and chemical weed control of onions and leeks.

No. 94. Potatoes (Revised) 8*s.* (by post 8*s.* 7*d.*)

In this new edition the authors have presented advice as concisely as possible about the varieties, economics and production of potatoes, plus seed certification and seed requirements.

TECHNICAL BULLETINS

No. 12. Proofing of Buildings against Rats and Mice (New) 4*s.* (by post 4*s.* 4*d.*)

Outlines the habits of rats and mice and describes proofing measures to prevent their entry into existing and new buildings.

ADVISORY LEAFLETS

(*Price* 4*d. each – by post* 7*d.*)

No. 28. Apple Blossom Weevil (Revised)
No. 352. Violets (Revised)
No. 512. Artificial Insemination of Poultry (Revised)
No. 517. Avoiding Losses in Calf Rearing (Revised)

The publications listed above are obtainable from Government Bookshops (addresses on p. 366), or through any bookseller.

30. Snowdonia

Ivor W. Jones

SNOWDONIA is the mountainous area of Caernarvonshire which extends from the Conway Valley in the east to Beddgelert and the Glaslyn river in the west. It is bordered to the north by the narrow coastal strip of Arfon lowlands, extending from Llandudno to Caernarvon, and to the south by the Mountains of Merionethshire and Denbighshire. Its English name is derived from Snowdon, the highest mountain. The Welsh name, Eryri, meaning a high uneven surface, is more indicative of the type of country, for it contains fourteen peaks, all more than 3,000 ft above sea level.

The effects of the Ice Age have produced variations in land elevations and direction of slopes unrivalled anywhere. With the natural formation of the numerous lakes, this produces a most spectacular scenery, and its special value was recognized by the formation of the Snowdonia National Park in 1951. The Nature Conservancy has also established Reserves to safeguard the natural plant and animal wild life, and geological features of outstanding interest such as Cwm Idwal. The Forestry Commission have planted the Gwydyr and Beddgelert Forests, extending to 15,000 acres.

The majestic grandeur of the district attracts thousands of visitors during the summer, and climbers come in large numbers throughout the year to challenge the variety of difficult climbs that abound there. The 1953 Everest team spent a great deal of their training period in Snowdonia, and thousands of commando troops were trained in this tough area during the war.

Slate quarrying is still a major industry in Snowdonia, and the bulk of the slates required in Britain are produced there. Stone quarrying on Igneous Rocks takes place on an extensive scale at Penmaenmawr. There are no mineral mines operating today, but copper, iron and lead ore were mined sporadically in the past. Hydro-electric power is generated at Cwm Dyli and Dolgarrog.

The area is one of the wettest in Britain. Snowdon itself gets about 200 inches of rain a year, and the average rainfall along the coast varies from 35 to 45 inches, with gradual increases in the upper regions away from the coastline. Although the peaks and mountain passes have their fair share of winter snow, the temperature is above the average for inland areas.

The soils in the uplands are generally very thin, and the continual leaching forms podsols on the slopes. Where draingage is impeded and the ground more level, peat has formed. The lowland soils, on the other hand, have developed mainly from drift deposits and vary greatly in texture and value.

The better arable fields support excellent crops and pastures, while close by there are pockets of poor and boulderous rough grazings. All soils are naturally very deficient in lime and phosphate. The hills are covered with rough grassland, heath and heather, but on the drier slopes facing south, bracken grows in abundance.

The average size of farm in Snowdonia is small, and physical factors of terrain, climate and vegetation dictate a pastoral economy. Usually, only a small fraction of the acreage of a farm is arable. The rotation is confined to grass, and arable crops are grown only on the better lands along the coast.

The whole farming economy is centred around the Welsh Mountain sheep. Because of their hardiness and agility, these are the only animals able to make full use of the poor upland grazings in summer and winter, and to survive the rigours of high winds, rains and the blizzards to which the area is so prone. Income is derived from the sale to lowland farmers of draft ewes at $3\frac{1}{2}$–$4\frac{1}{2}$ years for fat lamb production, the sale of wether lambs for finishing on the lowlands, and wool.

Keep is abundant in the summer, but the season is short, and surplus summer growth not consumed soon dies off. The older sheep are able to survive on this very inferior growth, but the ewe lambs and shearlings are sent to lowland farms over the winter.

The normal hill farm has a small acreage of reasonably clean land around the homestead, with a fairly large acreage of enclosed rough grazing or 'ffridd' between the farm and the mountain grazing. Land improvement is limited and often confined to fencing, drainage and surface liming and fertilizing. Stock improvement has developed under the auspices of the Arfon Hill Sheep Society, which registers flocks attaining certain standards set by their own panel of breeders, and holds annual sales of approved breeding rams and draft ewes.

Complementary to the sheep are herds of suckling cows, which usually calve in February, March or April. The calves are sold in October or November, which gives the cow time to rebuild body flesh to carry her cheaply over the winter and reduces the number of wintering stock. Much of the hay used is bought, and this is sound practice in an area where labour is scarce and expenditure on machinery not justified. The Welsh Black cow predominates, although a number of other breeds have been tried. It has better milking ability and the progeny, either from Welsh Black or Hereford sires, is in great demand at the autumn sales.

Below the 600-ft contour normal lowland farming is practised, but with rather more emphasis on the rearing of replacement stock and beef stores. Dairying is most prevalent in the lower-lying areas, where the bulk of the grazing and fodder comes from grassland and kale. Stock rearing is invariably a sideline for which the farmers have a natural aptitude. Agisting hill sheep during the winter months is the common practice. There are small areas along the coast where arable farming is the main enterprise, and where some farmers depend on fat lambs and beef cattle from grassland as their main sources of income.

Snowdonia is an area of farming contrasts within short distances; of lowland and hill farmers living in close harmony and partly dependent on each other for their living. It is an area where the District Agricultural Adviser must have one foot in the old unchanging world of hill sheep husbandry, and the other in the fast-changing, scientific age of modern farming.

R. E. M. CHAPLIN
Agricultural Land Service, Crewe

Cow conduct and loose housing design

THE main purpose of any industrial building is to provide, within available capital resources and subject to economic considerations, the most efficient layout and environment that can be devised to carry out a desired process or combination of processes. Once management has made a policy decision that a new process is to be started or an existing one expanded, it becomes the job of the professional adviser to reconcile the requirements of materials, workers, plant and machinery in formulating his plans for the proposed development. While this may sometimes be difficult, at least the requirements themselves can usually be ascertained quite easily. When planning livestock buildings for agriculture, however, it is not always so easy, for there is the serious disadvantage that it is not materials of known properties that are being dealt with but animals, whose requirements are not readily determined. Visits to different farms in search of information will show livestock successfully managed in a wide variety of ways in an almost infinite variety of buildings, and the conclusion is bound to be reached that stockmanship, feeding policy and other management skills exert much more influence on results than does the design of buildings.

There are, of course, space standards available in the case of any existing system of livestock husbandry which generally reflect a broad cross-section of existing practice. But such standards are usually modified in one way or another, either because it is found by experience that a building can house more stock than the number for which it was originally planned or because, at design stage, standards have to be reduced to suit an existing site. Thus the professional adviser can expect any standards he cares to use to be modified substantially at a comparatively early stage in the life of the building he is designing. This is particularly true of accommodation for loose-housed dairy cows because (*a*) the trend towards this system is gaining momentum as herds become larger, so that any extravagance in areas allotted per cow is magnified, and (*b*) the combination of climatic factors and the need to avoid polluting watercourses is encouraging totally-covered installations.

It was against this background that officers of the ALS trained in Work Study were asked in 1963 to suggest new housing standards for loose-housed cows, paying the due regard to labour economy, bedding usage and cow cleanliness.

At the outset it was recognized that collecting data from farms would be of little use because of the impossibility of isolating effects of building layout or design from management factors: earlier surveys had proved of limited value for this reason. An entirely different approach seemed necessary, and it was eventually decided to make a pilot study of cow behaviour in a small number of loose housing installations, with the idea of establishing the most promising way of tackling the problem. During the winter of 1963–64, round-the-clock observations were made, by a statistical technique called activity sampling, on ten farms widely distributed throughout England and Wales. The installations studied were very dissimilar, yet the essential pattern of overall behaviour was so strikingly similar that even from so small a sample it seems reasonable to assume that it is a pattern which cows will adopt if they can.

It was found that cows spent, on average, 44 per cent of their time lying down, 38 per cent moving or standing, and 18 per cent in feeding. The time spent in collecting yards and milking parlours was extremely variable, due to differences in layout and management practices, and was therefore excluded from the calculation of percentage activities. The significance of the figures lies entirely in the different circumstances under which they were obtained. For example, there was no appreciable difference in the length of time cows spent lying down whether they each had 40 or 70 sq. ft bedded area, nor in total feeding whether the cows were on self-feed silage or on rationed manger feeding. Frequency graphs prepared from the recordings showed that if bedded areas and silage faces were generous there was a tendency for there to be peaks of activity, with the cows behaving more or less as a herd; if the bedded area was smaller and the silage face more restricted, the peaks were much less pronounced.

It might well be said that this conclusion confirms what everyone connected with dairy cows already knew, namely that the cow is an extremely adaptable animal. But beyond that it poses the question of how far this adaptability can be exploited. There are already farms where cows are allowed no more than 30 sq. ft bedded area; some where silage face is $2\frac{1}{2}$ in. for self-feeding; yet others where they are allowed 1 ft or even less per head of trough space for controlled feeding. All these figures are well below current standards used in designing new loose housing installations, but if they are acceptable they would clearly allow a considerable reduction in space standards, with consequent economies in building costs. Indeed, it is within the bounds of possibility that in cubicle installations, for example, it is only necessary to provide cubicles for slightly more than half the herd if the cows are given a very restricted silage face. This, admittedly, is pure supposition which can only be confirmed or refuted by controlled experiments, but it does give some indication of the scale on which savings might be possible in the future.

In the past it has been customary for loose housing installations to be generously designed to allow scope for future expansion. More and more farms are now stocked to capacity, however, and with steadily mounting building costs a more precise set of standards is urgently required. Experience has shown that these cannot be obtained by collection of data from selected farms nor yet by further random studies of cow behaviour. The only way in which these can be achieved is through experiments in which the performance and health of cows can be studied under different housing conditions.

IN BRIEF

Fowl Pest Policy

In a written reply to a recent Question in the House of Commons, the Minister of Agriculture said: 'The results of the policy of controlling sub-acute Newcastle disease by statutory measures and the use of dead vaccine have been very encouraging. The incidence of the disease has been considerably reduced. I have therefore decided that the present policy shall be continued. It is essential, however, if good control of the disease is to be maintained, for maximum use to be made of the vaccine and for the recommendations of the manufacturers to be followed. The policy will be kept under review, particularly in the light of progress made in research on Newcastle disease and on vaccines at the Central Veterinary Laboratory.'

The present policy for control of sub-acute Newcastle disease in England and Wales was introduced on 1st April, 1963, following the report of the Committee on Fowl Pest Policy. The following six-year figures of the number of outbreaks of Fowl Pest are interesting:

	SLAUGHTER POLICY IN OPERATION				VACCINATION POLICY IN OPERATION	
	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65
April	76	203	60	463	77	255
May	58	182	64	518	107	151
June	65	54	71	287	105	100
July	18	36	64	281	90	53
August	40	32	66	260	116	39
September	63	62	66	193	164	51
October	163	139	106	242	302	93
November	649	227	101	169	280	85
December	683	484	186	177	279	126
January	449	266	250	326	376	131
February	287	104	230	295	475	78
March	145	82	312	126	365	80
Totals	2,696	1,871	1,576	3,337	2,736	1,242

Well over half (1,478) of the 2,736 outbreaks in the first year of vaccination policy occurred in Lancashire, Cheshire and Shropshire where the uptake of vaccine had been disappointingly low. On the other hand, in East Anglia, an area of high disease incidence in earlier years, vaccination coverage was very much better and the number of outbreaks was markedly less than in earlier years: disease was moreover contained in a comparatively small area; it did not spread and it had virtually died away by the beginning of 1964.

Of particular significance in the second year of vaccination policy was the marked decline in incidence since the summer of 1964, resulting in easily the best winter since 1958–59; in the six winter months (October to March) there were 593 outbreaks, compared with 2,077 for the winter of the first vaccination year and an average of 1,550 for these six months for the last four years of the slaughter policy.

Points in Pig Housing

In a new leaflet issued by the Ministry, *Pig Fattening Houses* (F.E.F. 46), reference is made to the lighting of a fattening house. There is no evidence that anything more than a low level is required. Indeed, strong sunlight can have a harmful effect, particularly on the lighter-skinned breeds. It has also been found that kept in semi-darkness pigs tend to be quieter, and less bullying takes place. Light is necessary only for feeding, inspecting and weighing the pigs, for which purposes an electric light is the obvious choice.

One 60-watt bulb placed over the feeding trough in a single-sided piggery should be sufficient for most individual pens, and one 150-watt bulb placed on the division wall line in an open piggery will serve four pens. Try to avoid placing the light where the pen division will cast a strong shadow over a large area of the pen. The installation should be carried out by a qualified electrician, and only switches and fittings which will withstand a high level of moisture should be used.

The number of pigs which can be housed in a pen is often controlled by the length of the trough. This must provide about 1 ft length per pig. Where it is intended to weigh the pigs in the feeding passage, some of the trough length must be taken up by gates. This is reduced to a minimum by placing the gates of two pens adjacent to each other across the corner of the pen. It can be eliminated altogether by converting part of the feeding rails into a sliding gate. A movable timber ramp is used to get the pigs over the barrier wall of the trough. This arrangement may well allow an extra one or two pigs to be kept in each pen.

The dung problem is also closely considered. The best way of disposing of the muck, whether solid or liquid, is to return it to the land. The less bulk there is, the easier it will be to store and move. This is an added reason for preferring a totally enclosed piggery, or at least one with covered dunging yards. The dilution of the manure with rainwater adds so enormously to its bulk that a storage tank capable of taking a supply for any length of time has to be very large and costly. On the other hand, for most of the year neat pig manure cannot be returned to the land without serious risk of scorching the growing crops. For this reason an adequate supply of water must be near at hand so that the manure can be diluted shortly before its application.

This leaflet, well illustrated by plans, is worth sending for—to H.M. Stationery Office (price 2*s*.) or you can order it though any bookseller.

Pasture Topping

Seldom is an animal capable of grazing with complete evenness and consuming all the herbage offered to it on a sward. Some farmers maintain that with highly intensive stocking and a heavy use of nitrogen, perhaps combined with irrigation, stock will graze a sward completely, but this is most unusual and under most circumstances varying amounts of herbage will remain after completion of grazing.

The problem of unconsumed herbage relates chiefly to the dairy cow; it increases as grazing succeeds grazing and there is more fouling of the sward. The situation gets worse as the season progresses, the grass becoming more stemmy and unpalatable and the animal more selective in its choice of herbage. Taking cuts for conservation between grazings is one way of reducing this problem but it is not always convenient. Some form of pasture topping must therefore be considered. To what extent can such a technique be justified?

Research at the Hannah Dairy Research Institute has shown that close cutting or grazing can influence herbage yields and that the dry matter produced by a sward is increased by 40 per cent by defoliation to within 1 inch of ground level, compared with defoliation to within 3 inches of ground level. This research has been confirmed

by subsequent work at Wye College, which also indicates an increase in leaf efficiency due to close cutting. It seems that close defoliation of a sward is important since it leads to higher production and to the maintenance of the sward in a leafy state. Research has also shown that intake of herbage by the grazing animal is greater on a leafy sward than on a stemmy one, and that milk yield is related to herbage intake.

Pasture topping can be justified on the grounds of production from a sward, provided cutting is *close*, and it should be an important feature of intensive systems of grassland production—notably in paddock grazing systems where pasture topping should take place as soon as possible after stock have finished grazing a particular paddock.

The choice of cutter for pasture topping is important. The traditional type of mower is generally unable to cut a sward closely—to within about 1 inch of ground level—and it also leaves a well-defined swath if much uneaten herbage remains. The flail-type of forage harvester is a more suitable implement, as it can be set to cut at the right level and it cuts the herbage into fine pieces which do not tend to lie in a swath and which quickly disappear. The recently-developed flail mower may well be one of the best machines for the job.

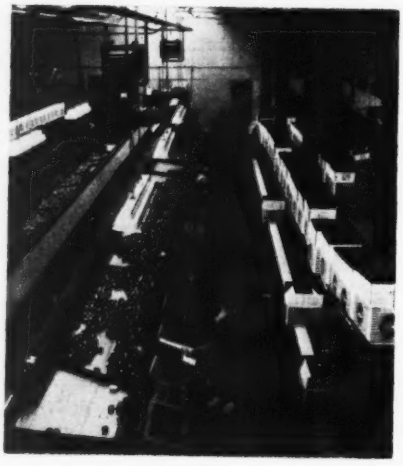
The grazing habits of stock make it difficult to provide the best conditions for subsequent regrowth and utilization. These can be overcome by a timely programme of *close* pasture topping with a suitable implement subsequent to grazing.

Horticultural Marketing: a new film

Corrugated cases for the packing of fruit, flowers, vegetables and plants is the subject of an adroit new film, *Packed to Perfection*, made in colour, for Reed Corrugated Cases Ltd. The message: the returnable wooden crate for horticultural produce is out; the expendable carton is in. Add to this the need to cut marketing costs by standardization—packing to a known and guaranteed weight—and we have a film which growers everywhere will be interested to see. Among examples quoted by the film is that of Home Grown Fruits, who today are using a non-returnable fibreboard case with a cell-type inner, holding 30 lb of apples at a cost of about 1*d.* a lb.

The film (16 mm) runs for 22 minutes and may be borrowed free from The Films Department, Reed Paper Group, Reed House, 82 Piccadilly, London W.1.

A packing station belonging to Home Grown Fruits Ltd.



Books

The Shearers and the Shorn. E. W. MARTIN. Routledge and Kegan Paul. 40*s*.

The ultimate concern of the author in this book is with the present social problems of the countryside—'de-population, malaise and discontent'. However, he does not see these problems as being entirely of economic origin. Rather he thinks it necessary to look at them against the socio-historical background and the conflict which has occurred in the first part of the twentieth century in rural areas between two types of culture or regime. The first of these is described as ceremonial and the second as democratic.

Mr. Martin examines this conflict by tracing, since 1800, the changing fabric of rural society in an area of Devon which centres on the small borough of Okehampton. He describes the existence, throughout the nineteenth century, of an hereditary land-owning elite which sustained itself by an elaborate ceremonial code of behaviour and a monopoly of power extending into every aspect of rural life. Towards the end of the nineteenth century the first elements of democracy were injected into this oligarchic society—principally through the agency of local government legislation but aided by economic factors which contributed to the break-up of landed estates. These forces acted only slowly, however, and the author contends that it was not until the first world war had accelerated social disruption that the two regimes were seen to be in open opposition.

From 1918 onwards, the actions of an expanding middle-class group, eager to take over many of the former functions of the squirearchy, and those of an increasingly influential and powerful working-class group have many times clashed with the persistent vestiges of the ceremonial code. Evidence of this is to be found, it is suggested, in the gradual weakening of local institutions and group associations which arises from the tension between traditional ways and contemporary ideas and habits. Thus de-population of a rural area is encouraged which, in turn, further saps the strength of rural institutions. Yet the author is optimistic that progress will eventually emerge from this conflict. The efforts of the nucleus of people who strive to co-ordinate rural life with national ideas and trends will surely result in a break-down of the social and economic barriers which have obstructed the flow of ideas and the growth of industry.

This book makes a notable contribution to our understanding of a pressing and difficult problem. In particular, it succeeds in the necessary task of emphasizing the importance of sociological factors which could very well prove crucial in any attempt to revitalize a rural area, for they may not lend themselves to the same degree of control as economic factors and also require time to expend themselves. Moreover, although parochial in its area of study, the conclusion it reaches seem capable of far wider application as rural societies everywhere come increasingly into contact with ideas and attitudes nurtured by industrial democracy.

Writing in a compelling style, Mr. Martin deftly weaves sociological generalization and comment with locally-drawn material and anecdote to produce a book which will undoubtedly be read with interest by workers in a variety of fields as well as by laymen. It constitutes a worthy addition to a growing list of studies in rural sociology which have emanated from Dartington Hall.

S.T.M.

A Knot of Roots. THE EARL OF PORTSMOUTH. Geoffrey Bles. 30*s*.

The Earl of Portsmouth, 'the rancher earl', has long been a famous figure in Britain. This is an interesting autobiography of a man who devotes his life to the understanding of the land. Gerald Vernon Wallop was born in 1898 in Wyoming, the nephew of the seventh Earl of Portsmouth. He succeeded to the title, as the ninth Earl, in 1943.

Born of an English father and an American mother, he grew up in the U.S.A. But in spite of his American childhood, the young viscount readily adopted the traditional British aristocratic way of life—the acceptance of responsibility for the land and the people in his care. He was at all times willing to press forward with new scientific methods for the benefit of his tenants and neighbours. In spite of crisis

after crisis, his optimism was unbounded, and something always turned up—a new farm, a new person or an opportunity to at least restore the *status quo*.

The book pursues its pleasant way at two levels—the fascinating personal story and the considered history and feeling for the land in Britain during its period of neglect, its build-up during the second world war and its status today.

His account of Kenya is of exceptional interest. The Earl's dynamic energy overcame many difficulties and did much to help form the modern nation.

The author is an able writer and has a number of books to his credit—although only one: *Horn, Hoof and Corn* (1932), written to combat the idea surviving in East Anglia at that time that corn was the only thing that mattered in farming, is mentioned in this work. This latest book, as might be expected, is rich in anecdote and is sheer joy and an instruction to read.

G.O.

Common British Grasses and Legumes (4th Edition). J. O. THOMAS and L. J. DAVIES. Longmans Green. 18*s*.

The production of a fourth edition proves the usefulness of this book, in which concise descriptions of floral and vegetative organs, and the distribution and economic value of twenty-eight grasses, fifteen legumes and one rosaceous plant, each face a page of clear line-drawings illustrating the distinctive features of the species.

In the introductory chapters, the botanical structure of some British grasses is described, botanical terms are explained and illustrated, and economically-important characters of grasses are discussed. There is a workable key to the vegetative characters of some common grasses, including a few not referred to in the book, but no keys for flowering specimens or commercial seeds. (Books in the bibliography contain such keys but are not mentioned in the text). Legumes are treated similarly, with a general chapter and a key to vegetative characters. Seedlings, plants, flowers, pollination and root-nodules are described and illustrated, but not hard seeds.

The species described are those most likely to be found in permanent or sown agricultural grassland, although the continued inclusion of darnel (*Lolium temulentum*) in the key is surprising and so is Lesser Burnet (*Poterium sanguisorba*, Rosaceae) placed alphabetically among the legumes.

The notes on economic value have been brought up to date. They mention modern varieties and pedigree strains and also new uses, such as silage-making and direct reseeding, which have led to a reassessment of the value of some species. There is a list of S-numbers of Aberystwyth varieties of grasses and clovers but it does not distinguish hay from grazing strains. A glossary of botanical terms and the use of both Latin and common names in the index help non-botanists; students requiring more details can consult the bibliography of twenty-five titles, which includes some recent publications.

The book provides quick and easy reference to information about the chief British agricultural grasses and legumes, for students of agriculture and botany at all levels. Most of the Latin names used agree with Clapham, Tutin and Warburg's *Flora of the British Isles*, 2nd edition, 1962.

J.M.T.

T.V. Vet. Book for Stock Farmers. THE T. V. VET. Farming Press. 35*s*.

It can be said at once that here is a novel text-book which packs a large amount of information into a volume of acceptable size.

There are ten sections, each dealing with a group of related conditions. Most of the common cattle ailments are covered, and the advice on preventive measures should prove of great value to stock farmers. Veterinary surgeons will find some of the suggested therapy controversial.

The author's efforts to use non-technical language have, I think, resulted in oversimplification, and misuse of the word 'bugs' in lieu of 'germs' or 'bacteria' is to be deplored.

In the section describing mouth ailments, it is surprising to find no warning note that, with salivating cattle, the possibility of foot-and-mouth disease must never be overlooked—one more good reason for seeking early professional advice.

The concept of using series of photographs and reducing script to a minimum is brilliant. Unfortunately, the point of many of the pictures is ruined, and in some cases rendered frankly misleading, by lack of co-ordination with the script. This fault is largely due to the placing of directives at the end of paragraphs instead of immediately after the explanatory sentence. A typical example occurs on page 30, where one looks in vain for the cow succumbing to heart failure.

A great deal of work must have been devoted to assembling the 300 photographs. Many are excellent, e.g., those demonstrating ringworm and the eye pictures on page 49. Others are less good, and a few would have been better omitted.

Despite these criticisms, there is much that will be helpful and instructive to stock farmers and students. To me, the main interest of the book lies in the potentialities of pictorial technique. It is easy to visualize how readily this could be adapted to demonstrate intricate surgical procedures, thereby eliminating the need for tedious and confusing verbal descriptions.

M.H.

Farm Tractors. BRIAN J. BELL. Cassell Farm Books. 5*s*.

This excellent book is intended primarily for Rural Studies classes in Secondary schools and for students preparing for examinations such as those of the City and Guilds in General Agriculture. It will also be useful to any boy who is starting work on a farm; indeed it contains much which will make it helpful as a reference book for people who are already driving tractors, but find that the modern streamlined exterior tends to hide from view some of the components of the mechanism.

The questions at the end of each chapter show that the author is an experienced teacher who has had to deal with inquiring minds and also has had to forecast the kind of question likely to be asked by examiners. Before the questions in each chapter there is a section headed 'Things to do', and many of these are an invitation to go and look at tractors rather than only to read about them. For example, one of them instructs the reader to trace the flow of fuel from the tank to the injectors on a diesel engine. Any student who did this would get a better idea of the care with which the manufacturers have arranged for the filtering of the fuel than he would get from many hundreds of words of text in a book.

The author has managed with great skill to give good working descriptions without too much reference to principles. He shows the essentials of coil ignition without actually going into the function of magnetism in transforming the current from a low voltage one to a high voltage one, and of hydraulic systems without any general dissertation on the principles of transmission of power by fluids. This practical approach goes well with his evident intention to keep the student interested by frequent reference to the features which boys learn so much about from the descriptive leaflets put out by the manufacturers. The hearts of many readers will warm to Mr. Bell when he uses such half-slang phrases as 'diff-lock' and 'live-p.t.o.' because they will know that he is just as familiar with manufacturers' brochures as he is with text-books.

H.J.H.

Design and Construction of Dairy Buildings. B.S. Code of Practice, No. 11. British Standards Institution, 2 Park Street, London, W.1. 12*s*. 6*d*.

This British Standard sets down in simple terms good practice in the design, location and construction of farm dairy buildings, and the services for them. It deals with cowsheds, parlours, yards and dairies and gives detailed dimensions, data on good construction, and notes points of design and layout which the designer should not overlook. It is, therefore, a useful *aide-memoire*.

Much of the information is authoritative and detailed, but vagueness creeps in on certain features, for example, ventilation and equipment, where more positive recommendations are needed. More serious is the failure to deal adequately with the most modern parlour, the herringbone, of which only the barest description is given, and those three important topics—slats, slurry and cubicles. These get no more than a mere mention in three short paragraphs at the end, and no recommendations are made. This would be understandable if the Code had been published two years ago, and had this been so, then a revision would urgently be due. With these subjects fully and adequately covered the price of 12*s*. 6*d*. would then be reasonable.

R.B.S.

Books Received

Forty-Fifth Annual Report of the Forestry Commissioners, for the year ended 30th September, 1964. H. M. Stationery Office. 8*s*. 6*d*. (by post 9*s*. 1*d*).

The Hannah Dairy Research Institute, Ayr. Report for the three years ended 31st March, 1965.

John Innes Institute Annual Report, 1964. 3*s*. from Bayfordbury, Herts.

Rothamsted Experimental Station Report for 1964. 15*s*. from the Librarian, Harpenden, Herts.

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Salary £1,374—£2,757 a year, plus 25% terminal gratuity. Passages provided. Quarters available. Education allowances. Appointment on contract for two tours of 21 to 27 months each tour. Generous leave.

Candidates, who should be nationals of the United Kingdom or the Republic of Ireland, should apply for further details giving full name and brief particulars of qualifications and experience, quoting RC 213/183/014 to:

Appointments Officer,
Room 301,
Ministry of Overseas Development,
Eland House, Stag Place,
London, S.W.1.

OFFICIAL APPOINTMENTS

ENTOMOLOGIST—MALAWI

Required to supervise phytosanitary services including exports and imports; to carry out systematic work in the museum; to identify pests and advise on control measures; to carry out some entomological research.

Candidates should hold a degree in Natural Science, preferably with second-class honours, of which Zoology should be a principal subject. Some post-graduate experience is desirable.

Salary £1,485—£2,600 a year plus 15% terminal gratuity. Passages provided. Education allowances. 2–3 year contract, Government quarters.

Candidates, who should be nationals of the United Kingdom, or the Republic of Ireland, should write for further details, giving full name, and brief particulars of qualifications and experience quoting RC 213/134/05 to:

Appointments Officer,
Room 301,
Ministry of Overseas Development,
Eland House, Stag Place,
London, S.W.1.

ENTOMOLOGIST
UGANDA

Required to carry out surveys and conduct research into pests of crops and stored produce especially cotton, coffee and cocoa and to advise on control measures.

Candidates should possess an Honours degree in Zoology or a relevant subject plus two years post-graduate study in Agricultural Entomology.

Appointments on contract for one tour of 21-27 months. Salary scale £1,374–£2,757 a year, plus terminal gratuity of 25%. Education allowances. Passages provided. Generous leave. Government quarters.

Applicants should be nationals of the United Kingdom or Republic of Ireland and should apply for further details, giving full name and brief particulars of career and qualifications quoting reference No. RC 213/183/07 to:—

Appointments Officer,
Room 301,
Ministry of Overseas Development,
Eland House, Stag Place,
Victoria,
London, S.W.1.

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD

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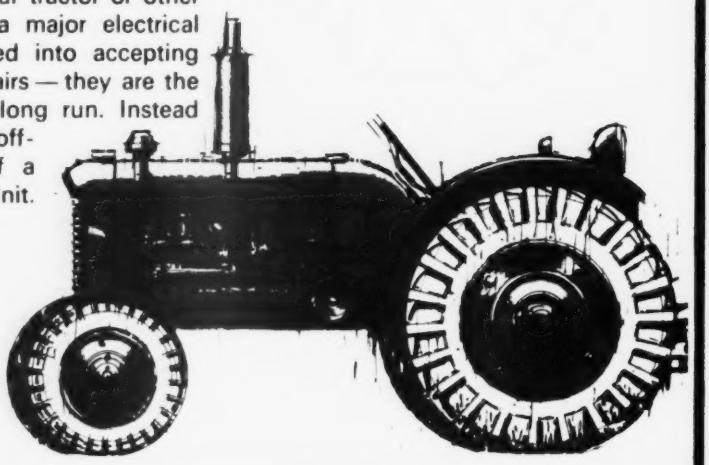

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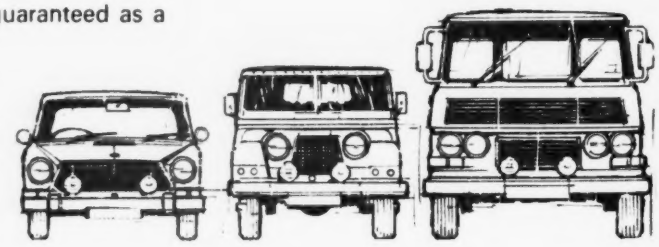

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